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Neurobiological Underpinnings of Politics: A Physiological Instance of Non-Democratic Predispositions in an fEMG & EDA Pilot Study

A thesis submitted in partial fulfilment of requirements for the degree of Doctor of Philosophy in Analytical Political Science

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A NOTE ON AUTHORSHIP

I hereby declare that this thesis is solely my own work, unless otherwise stated, and it has been written in accordance with prerequisites and precepts of Department of Politics and European Studies, Faculty of Arts, Palacky University Olomouc, for doctoral studies. All the data sets and sources have been faithfully stated in References. Selected chapters of this thesis have already been peer-reviewed and issued or delivered as conference contributions at Palacky University and University of Oxford.

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ETHICAL STANDPOINT

This thesis, its research design and respective testing have been conducted thoroughly and in line with the principles of medical bioethics and the Code of Ethics as enforced by the *Neuromarketing Science and Business Association* (NMSBA).

The author hereby declares that no conflicts of interest may be anticipated.

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DEDICATION

To my late godmother, Frances.

LIST OF ACRONYMS

ACC	Anterior Cingulate Cortex
AI	Artificial Intelligence
APSA	American Political Science Association
ARF	Advertising Research Foundation
ARV	Average Rectified Value
BAW	Brain Awareness Week
BCE	Before Common Era (formerly known as BC: Before Christ)
BDW	Belief in a Dangerous World
BOLD	Blood Oxygenation Level Dependency
BVP	Blood Volume Pulse
CANOE	Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism
CAT	Computerised Axial Tomography
CE	Common Era (formerly known as AD: Anno Domini)
CEBEX	Centre of Behavioural Experiments
CEE	Central and Eastern Europe
CNS	Central Nervous System
CNS meetings	Computational Neuroscience Meetings
CO-LAB	Cognitive Laboratory
CT	Computed Tomography (formerly known as CAT)
DSI	Diffusion Spectral Imaging
DTI	Diffusion Tensor Imaging
dlPFC	Dorsolateral Prefrontal Cortex
DPCC	Dorsal Posterior Cingulate Cortex
ECG	Electrocardiogram
ECoG	Electrocorticography

EDA	Electrodermal Activity
EDX	Electrodiagnosis
EEG	Electroencephalography
ELS	Ethical, Legal, and Social [Ramifications]
EMG	Electromyography
ERN	Event-Related Negativity
ERP	Event-Related Potentials
ESOMAR	European Society for Opinion and Marketing Research
EU	European Union
fEMG	Facial Electromyography
fMRI	Functional Magnetic Resonance Imagining
GSR	Galvanic Skin Response
HUME LAB	Experimental Humanities Laboratory
IAT	Implicit Association Test
ICJ	International Court of Justice
IPSA	International Political Science Association
IRB	Institutional Review Board
LABELS	Laboratory of Behavioural and Linguistic Studies
LEVYNA	Laboratory for the Experimental Research of Religion
LGBT	Lesbian, Gay, Bisexual, and Transgender
LMS Centre	Language, Mind, and Society Centre
lOFC	Lateral Orbitofrontal Cortex
MEG	Magnetoencephalography
mOFC	Medial Orbitofrontal Cortex
mPFC	Medial Prefrontal Cortex
MRI	Magnetic Resonance Imaging
NAcc	Nucleus Accumbens
NCS	Nerve Conduction Studies

NIE	Neuroscientific Imaging Evidence
NIRS	Near-Infrared Spectroscopy
NMSBA	Neuromarketing Science and Business Association
NS-SCR	Non-Specified Skin Conductance Response
OCEAN	Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism
OFC	Orbital Frontal Cortex
PCCR	Pupil-Centre Corneal Reflexion
PCL	Perception and Cognition Laboratory
PET	Positron Emission Tomography
PFC	Prefrontal Cortex
PLESS	Prague Laboratory for Experimental Social Sciences
PM	Prime Minister
pMFC	Posterior Medial Frontal Cortex
PPE	Philosophy, Politics and Economics
PTSD	Post-Traumatic Stress Disorder
QEEG	Quantitative Electroencephalography
ROIs	Cortical Regions of Interest
RWA	Right-wing Authoritarianism
SC	Skin Conductance
SCL	Skin Conductance Level
SCR	Skin Conductance Response
SDO	Social Dominance Orientation
SEEG	Stereoelectroencephalography
SFS	Spiritual Foundations of Society
SMR	Sensorimotor Rhythm
SPL	Skin Potential Level
SPR	Skin Potential Response

SQUID	Superconducting Quantum Interference Device
SST	Steady State Topography
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TBI	Traumatic Brain Injuries
TDCS	Transcranial Direct-Current Stimulation
TMS	Transcranial Magnetic Stimulation
UK	United Kingdom
USA	United States of America
USSR	Union of Soviet Socialist Republics
vACC	Ventral Anterior Cingulate Cortex
vmPFC	Ventromedial Prefrontal Cortex
VS	Ventral Striatum
WVS	World Values Survey

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Die Politik ist keine Wissenschaft,
wie viele der Herren Professoren sich einbilden,
sondern eine Kunst.

Politics is no science,
as professors may imagine.
It is an art.

Otto von Bismarck
(1815–1898)

INTRODUCTION

Democracy *"in retreat"*, a title that appeared in the *Freedom House Report* on 2019 summarising the ongoing decline in the rate of human rights, democracy, and freedom standards across the world. Whereas, according to the study,[1] 39% out of the 7.9 billion population, accounting for 44% out of 195 countries, may be found in democratic and free conditions, the other 24% of people remain in only partly free ones, and 37% of the world population live under non-democratic and unfree reigns (Freedom House 2019, pp1–9). On the whole, there has always been less or solely antidemocratic states *(sic)* in its inner forms (cf, Sartori 1987, pp182–213), lately, however, a significant increase may be seen in the group of authoritarian regimes that are being patronised either by holding regular elections, yet with an occurrence of irregularities in the forms of *electoral authoritarianism,* or by the censorship as a *digital type of authoritarianism* (Schedler 2006; Freedom House 2019; Sinpeng 2020). These two attributes do not exclude one another. This oft-replicated formula has been spread due to the fact that citizens favour rigid regimes in exchange for political stability in their region and/or country, and thus the number of partly free and not free countries dominates this era (Morse 2012, p161).

Not only ancient philosophers, such as Aristotle (1998) or (Plato 2000), did consider the eventual role of biology in politics, they had also opened the traditional debate of modern political science on the best possible setting and functioning of the system of governing (Kullmann 1991; Peterson, Somit 2017). Yet democracy used to be comprehended utterly differently in antiquity, the appearance of every political regime, however, has been affected by small groups of elites (cf, Dahl 1989; Linz 2000). The role of citizens as voters has gradually grown from the turn of the 19th and 20th

[1] As an organisation, *Freedom House* has been renowned for its classification into three categories: free, partly free and not free countries. Even though there are other institutions and indices, such the *Polity Index, Democracy Index,* and *V-DEM Index*. Many of their findings are not out of the common run, the *Freedom House's* categorisation represents a simple but sophisticated instrument of comparison.

century (Huntington 1996).[2] The question is self-evident then: *Why* do people still tend to vote for leaders of which election programmes are in essence non-democratic? Especially, if bearing in mind the unfounded idea of political stability as a means of justification (see Ferguson 2012). In defiance of recent sociological attempts to answer the query (eg, Miller 2017; Schedler 2015), a certain issue remains unclear. Are there any physiological predispositions in human political nature? And forthwith, another cardinal query looks for answers on how ideology determines political behaviour when considering the agedness symbolised in this traditional duality of opinion (Hibbing, Smith, Alford 2014a).

Even though political behaviour became permanent part of political science thanks to the American scientists in the 1950s and 1960s, a vast majority of books and papers have concentrated mostly on the institutional settings *per se* and, as in behaviouralism, on the decision-making processes as known in economy, for instance. Nonetheless, the fact is that the core of the *"political mind"* must be sought more deeply in human beings, not only in their most visible courses of action. And the ideal and yet most complex solution may dwell in *"the three-pound enigma"* (Moffett 2006). As an accelerator, the human brain embodies one's entire life, ie, all the stages of human life, emotions, memories, experiences, and activities.

The human brain and mind have been pondered upon not only by physicians, but also by many great philosophers.[3] Within the human body, the brain, significantly differentiating the humankind from other species (Carey et al. 2002), poses an indispensable attribute responsible not only for everyday sentiments, clandestine thoughts and impressions, it is primarily in charge of the mental environment and

[2] According to scholars representing the movements of participatory and deliberative democracy (cf, eg, Pateman 1970; Macpherson 1977; Habermas 1981; Fishkin 2009), it is suggested that a further inclusion of citizens is key in the process of decision-making, and thereby giving everyone more powers.
[3] Kuře and Petrů (2015, p9) aptly state that *"medicine and philosophy have always intersected since time immemorial"*.

body functioning. As a unique universe, this organ functions under the command of 100 billion neurons and ten times more of all the cells (Herculano-Houzel 2009).[4]

Although the *"human behaviour is incredibly complex and astoundingly broad"* as Horsley (20014, p179) notes, the very first attempts to examine and expand upon aberrant attitudes towards democracy, as it is known nowadays, appeared right away by the end of the Second World War. This period has been predominantly associated with Hannah Arendt, a political theorist whose work had pursued selected aspects of human nature and, above all, the banality of Evil (Arendt 1958; 1970; 1973; 2006). This debate has, however, endured and remained both criticised and appreciated at the same time (cf, eg, Bergen 1998; Lozowick 2005; DiJoseph 2010; Wolfe 2011; Brannigan 2013; Minnich 2016; Saxonberg 2019; Shaw 2019).[5] Concurrently, the concept of democracy has experienced many modifications in perception and understanding. And the growth of more detailed and conceptualised democracy has induced its *"indefinable"* character, as Sartori remarked (1995, p33).

Overall, the human brain is the most complex natural unit commanding the body both physically and mentally in the form of behaviour, and so does democracy likewise determine the human life in specified conditions. Since this *"neurocentric age"* (Becker 2010; see also Dunagan 2010) has brought a significant expansion of modern technologies, it implies brand new research opportunities (Choudhury, Nagel, Slaby 2009; Smith, Whitaker 2014). And therefore, in this thesis, two considerably challenging themes, represented by biological aspects of the brain and physiology together with democracy, are expected to encounter.

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[4] Yet the human brain may not be employed completely as often wrongly assumed by the *10% myth* according to which only approximately 10% of the brain's capacity may be used by humans, thus creating a room for a belief that everyone may be and/or become even smarter. This fallacy does not meet any scientific research study outcome though. Similarly, as in case of alcoholic beverages *killing* the brain cells, a single hemisphere leverage over the other one, and other delusions the general public tend to believe (Burgess 2018).

[5] The topic of Evil is also famously associated with Nietzsche's (1886) *Jenseits von Gut und Böse*, translated as *Beyond Good and Evil*.

Tradition has it that scholars have always inquired political behaviour. This agelong interest has resulted in centuries of research on human nature and its features. As demonstrated in this thesis then, not only different approaches have been employed, various areas of social science and humanities were given unequal chances to flourish in respect of biology and neuroscience, respectively. Whereas psychology met the criteria naturally due to its mutual relations with medicine, many others, and especially politics and political science has been lagging behind significantly, as pointed out by Matusall et al. (2011) and depicted in the total of *Top100 papers* between 2000–2009 in Figure 1. In a dark colour, it also exemplifies an increase of interdisciplinary-oriented journals.

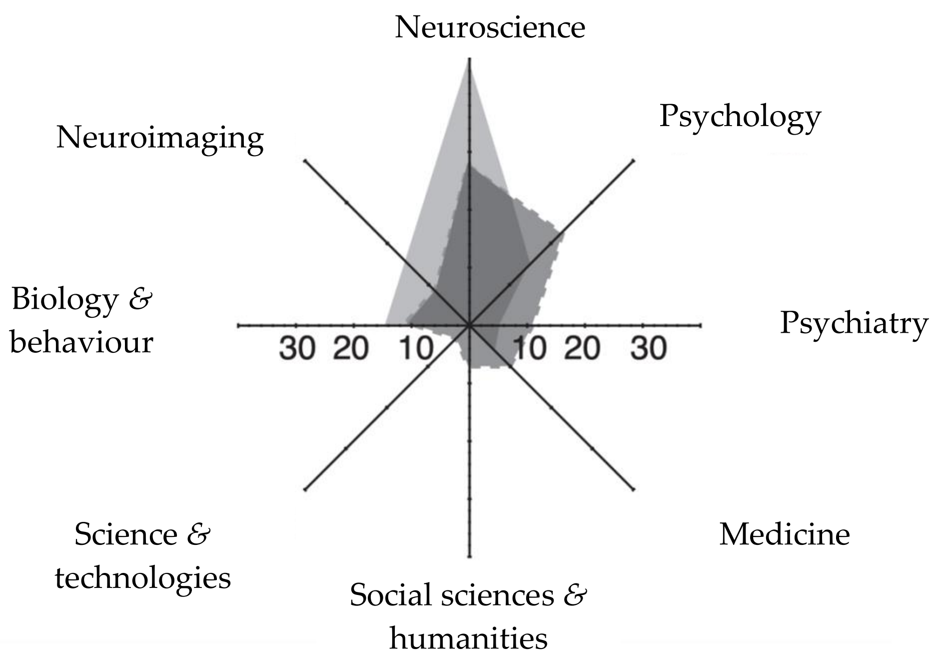

Figure 1 Themes in the social neuroscience research (2000-2009)
Source: Matusall et al. 2011, p19

Despite the fact that many new scientific fields have been formed due to its locking onto neuroscience, and thereby settling down separate neuro-x fields,[6] politics, as part

[6] The abbreviation stands for any newly emerging field that used to be *sensu stricto* known as part of humanities or social sciences but lately, it has started to employ the tools of neuroscience.

of social sciences and humanities, has not been able to expand yet (see Kováč 2013). As discernible, psychology and neuroscience have qualified as two main and the most fruitful areas of research. Therefore, it remains crucial to elaborate on conventional themes of politics and reconsider these from a new perspective. Many studies have already presupposed the relevance of this type of investigation, and on top of that, new trajectories had been outlined (Choudhury, Nagel, Slaby 2009). They, however, mostly focus on attributes very much traditional regarding the research in political science. For the purpose of presenting political issues within a more profound and biological research approach, five central and broad objectives of this thesis may be identified:

i. *To map* thoroughly and put political science into context of biological investigations, and physiology in particular, extending beyond to neuroscience in the form of neuropolitics. Furthermore, biologically oriented social sciences and humanities shall be mapped in the Czech Republic and Slovakia wherein, similarly as in case of the Continent, these contemporary approaches have been falling behind. Alongside the main research centres, the most distinguished and relevant scholars shall be recognised. At the same time, the most complex obstacles are to be defined.

ii. *To scrutinise* the previously realised research and further possibilities of social neuroscience in order to appraise the research methods in which political phenomena may be operationalised, since there are many books characterising the tools of neuroscience. None of them, however, has delivered a compact set of instruments specifically for neuropolitics in respect of possible advantages and disadvantages.

iii. *To explore* neuropolitics and its application, required features, and suitable and common methods and tools. Therefore, the evidence on how neuropolitics may be greatly beneficial, not merely regarding the neuroethical queries.

iv. *To elaborate* on the erstwhile research articles in both neuroscience and political science regarding democracy, non-democratic regimes, and the concept of authoritarian personality in order to apply and interconnect the fields in terms of a physiologically based investigation.

v. *To make contribution* to the lively debate on democratic and non-democratic political regimes and its leaders and thereby adverting to the *mariage de raison* of politics, and political science as such, to neuroscience. On the whole, the text shall stress the wide range of utilisation in the domain of political regimes, governing, leadership and campaigning as well. Owing to the pilot experiment in the thesis, the text shall fill at least one tiny gap amongst many others in this newly blooming and less anchored scientific neuro-x field. Subsequently, neuropolitics is to be exposed as in need of further explorations and studies so that the principal challenges are to be overcome.

Specifically, the thesis endeavours to continue to elaborate on democracy and non-democratic regimes with authoritarian personalities leading their countries. The objective is to go beyond the origins of political regimes, its establishment and stabilisation while studying the reasons following the non-democratic predispositions in profound traits rooted in biological bases, so that another realm of political research may flourish anon. Hence, as much as democracy and non-democracy are being perceived and considered to be relevant and momentous topics (cf, Møller, Skaaning 2010), this thesis elaborates on previous papers highlighting the paucity of research studies in this territory (Kováč 2007, p53). According to Kossowska, van Hiel (2003) and Thorisdottir et al. (2007), new studies should have recognised the importance of the basic division between the East and West. Although the Cold War and the bipolar world ceased to exist more than 30 years ago, this feature has endured significantly in political behaviour of given groups of peoples (see Aspelund, Lindeman, Verkasalo 2013; Piurko, Schwartz, Davidov 2011). When comparing sundry studies, notwithstanding the small numbers, they are being dominated by the West. On that account, the thesis embraces a pilot study with pupils as participants who have just come of age and are originally from the Czech Republic, thus from the territory of Central and Eastern Europe (CEE), since the objective is to elaborate on the recent and only findings within this area which were contributed by Kremláček et al (2019). His team had rerun Amodio et al.'s (2007) EEG experiment studying the links between political leanings and neural activity through the event-related potential (ERP) when focusing on the error related negativity (ERN).[7] Their findings suggested that the vital variable used in neuropolitics had not been able to demonstrate the same level of strength of correlation. Therefore, it could count against the generalisation and universal application of neuropolitical research findings. In order to avoid certain limitations originating in the use of electroencephalography (EEG) and students as research samples,[8] the experiment conducted within this thesis employs two tools of electrodiagnosis techniques (EDX), EDA and fEMG, which are completely distinct, and the aforementioned studies have omitted to use them. And besides, these two instruments may allow researchers to disengage from the overuse of EEG and functional magnetic resonance imaging (fMRI) and respective problems, too. Furthermore, the findings shall set forth whether physiological aberrations and ideological leanings may elicit dissimilarities in non-democratic predispositions. While all the mentioned studies had concentrated on ideological aspects in relation to the partisanship or voting behaviour, this thesis sets itself the pioneering task of inquiring the essence of democratic and non-democratic aspect of political mind.

In the concrete, the research design ameliorates previous attempts to comprehend the liaisons between political leaders and their voters (Yücel et al. 2015), which may be disputable due to the methodology and for the lack of neuroscientific tools. Analogically to the former studies, the thesis shall not focus merely on political behaviour, but also possible physiological traits in preference towards democratic or non-democratic politicians. Stewart, Bucy and Mehu (2015) state that this type of research fits in the vacancy for neuropolitical research that is crucially needful at this stage *"to provide greater insight"*.

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[7] The experiment of Amodio et al. (2007) will be expounded further in the thesis.

[8] Additional information may be found in *Chapter 4.3.1* on EEG.

Burdensome disarrays in terminology

Prior to inquiries, there are respective adjectives of which deeper clarifications remain crucial in order to avoid dubious tendencies as observed in many papers and contributions in this area. In defiance of interchangeability in case of some terms as adjectives, there are some of which content linger misleading, especially in connexion to political science.

Biology and *biological* x-fields may be perceived as the most universal in this aspect. In total, biology accounts for subdisciplines as biochemistry, genetics, and molecular biology. Among these, physiology plays a key role for social sciences. By analogy, *physiological* research is based on alive animals and the biological processes and functioning taking place at the cell, tissue, and organ level. In comparison to *pathophysiological*, regular and normal reactions are to be observed in physiology, whereas in the latter, crucial distinctions caused by diseases are studied. In relation of politics, the physiological, as an adjective, has been used in order to express functional responses to particular [political] stimuli and traits (eg, Dodd et al. 2012; Oxley et al. 2008; Weissflog et al. 2013) as in case of this thesis. Therefore, physiology with biological foundations, *vide infra*, may correspond to behaviouralism in political science.

Biomedical politics examines the evolution of certain enhancements and medications such as the abortifacient, for instance. Biology then influences medicine. Consequently, relations taking place amongst various stakeholders as scientists, lobby groups, political representatives, and the public may be of relevant importance if examined rigorously (cf, eg, Hanna et al. 1991; La Vaque 2001). Biomedical politics, combining the biological and medical with political decision-making processes, frequently collides with medical and political ethics. In social and political sciences, these research foci lie in healthcare and public health studies.

Cognitive and cognition itself, as a fundamental factor, has been dated back to Aristotle's work, and it still keeps expanding due to the discoveries and improvements made in biology, chemistry, and neuroscience (Taber 2011).[9] For cognitive sciences, there are many disciplines being involved.[10] Cognition, as a course of imbibing knowledge and understanding it, falls into subcategories. Among these, it is social cognition playing a crucial role when differentiating itself from the others, as exemplified by Greenwood (2019). Respectively, social cognitive neuroscience as a developing area analyses the impact of brain functions on cognitive activities that consequently affects social behaviour (Gazzaniga, Ivry, Mangun 2014, p560). From the respective cerebral angle, social cognition is dominantly linked to the medial prefrontal cortex (mPFC).[11]

When initially pondering upon the biological aspect, cognition *"encompasses the analysis of human transcendence, tracing it back and down to its biological and molecular roots"* (Kováč 2000, p33). Figure 2 then depicts the brain regions engaging predominantly in social cognition. A specific segment in socially oriented cognition, *political cognition*, has also been recognised,[12] and its aim is to examine not only one's connexion to politics, but even political decision-making processes and political behaviour. At first glance, political cognition may resemble *"riding a bicycle"* (Lieberman, Schreiber, Ochsner 2003, p682) because it is not easy to clarify this ability. The fact is though that in political decision-making processes, cognition functions in a more complex way. As the authors aptly summarise the situation regarding political behaviour and thinking as *"[people] do not know what they do not know"* (ibid).

[9] Cognitive science *per se* is not, however, capable of clarifying political phenomena in physiological research (Tingley 2006, p6).

[10] For instance, one may distinguish among cognitive neuroscience, religion, biology, anthropology, (neuro)psychology, cognitive politics, etc.

[11] Other regions, however, were also indispensable as frequently assumed. These are especially the temporoparietal junction, orbitofrontal cortex, amygdala, superior temporal sulcus, and temporal poles (Mitchell, Mason, Macrae, Banaji 2006, p65).

[12] For instance, Cataldo (2017) and his book focused on practical facets of communication within political cognition in its pure form, ie attempts to better understand the humans when processing sundry political phenomena.

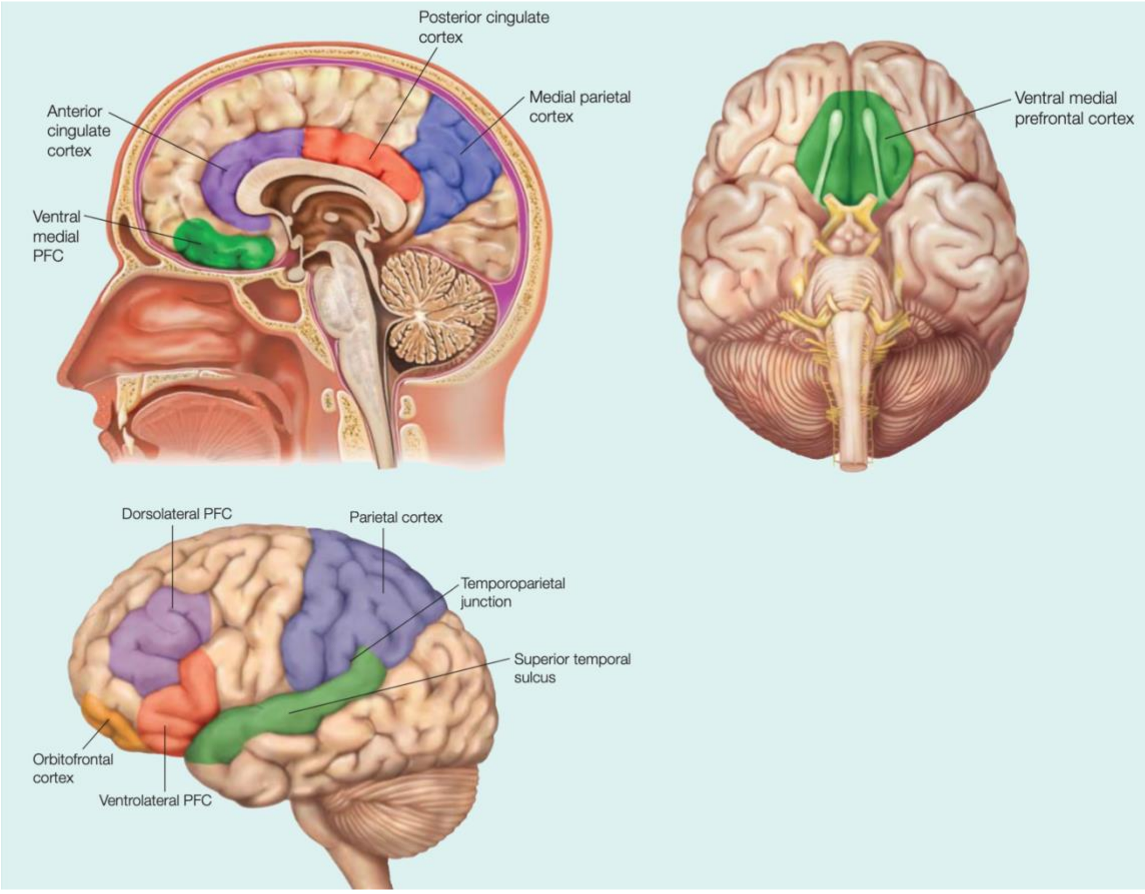

Figure 2 Social cognition in brain regions
Source: Gazzaniga, Ivry, Mangun 2014, p562

There are two analogously appearing terms that must be characterised and distinguished specifically and separately, and these are biopolitics and neuropolitics.[13] *Biopolitics* may be dated back to 1920 when Rudolf Kjellen coined the term at the *University of Uppsala*. And in 1938, *Bio-politics*, a book written by Morley Roberts, a biologist, was issued in Canada. His aim was to study relations between biology and politics (Liesen, Walsh 2012). However, it achieved fame in the 1970s with the goal to clarify the role of power and its use (Foucault 2008). Nonetheless, it would be incorrect to claim credit to the theorist it has been associated with, Michel Foucault.[14] The postmodernists comprehend biopolitics reversely though. According to Foucault and

[13] Neuropolitics will be analysed from a historical and scientific angle in *Chapter 3.2*.
[14] The fact is, however, that M Foucault was the first one to analyse biopolitical principles of Nazism when likening it to *"thanatopolitics"* (see Esposito 2008, p110; Adorno 2014, p106).

postmodernist scholars' views, political and social powers are there to affect the human life.[15] Therefore, this approach goes *a contrario* whilst emphasising the societal surroundings without biological underpinnings as regularly assumed in contemporary research (Liesen, Walsh 2012). Therefore, from the position of philosophy and political science, there are two fundamental and dissimilar comprehensions of biopolitics. In defiance of many dictionaries emphasising the biological basis for investigations of political behaviour, in reality and academic milieu, as concluded by Bucy (2012, p1), the postmodernist (or Foucauldian) mindset has prevailed, and not only the purely biologically based approach was eclipsed but *"… we have lost control over the term"* as a whole (see Mills 2018).

An initially crucial distinction between *neuropolitics* and *biopolitics* lies in research methodology (Coleman, Grove 2009). Whereas methods of biopolitics are predominantly, but not merely, philosophical and founded on economic and power relations, political neuroscience endeavours to explain distinctive phenomena of [political] behaviour whilst using modern technologies and tools of neuroscience because the last five decades have been significant for pioneering discoveries in the brain functions and anatomy (Cacioppo, Decety 2011). Biopolitics, on the other hand, share many similarities with medical politics while it also summarises philosophical and ethical issues (cf, eg, Klawiter 2011; Roberts 2009). Altogether, the evidence offered from neuropolitics and biopolitics differs as a matter of principle. Whereas biopolitics interprets biology,[16] social strata alternations and power, neuropolitics, on the contrary, uses modern techniques of neuroscience to obtain brain-image scans or other types of proof of physiological activity to elaborate on the inquired issue. Lavazza (2007, p944) aptly summarises that biopolitics *"has expanded from [merely] scientific to technological"*.

[15] Subsequently, biopolitics may be seen as a means of biopower which, according to Foucault, represents the true perils jeopardising the mankind (Liesen, Walsh 2012).
[16] As Liesen and Walsh (2012) note, this perception of biopolitics goes back to the 1960s, and it is associated with Lynton K Caldwell, an American political scientist.

Most conspicuously, a gradually established term of neuropolitics has no practical equivalent in science. In comparison to other academic disciplines, *neuropolitical science* has never been very much in use. The covert reasons may be arising from the negative experience with the biological abuse in order to justify all the atrocities as committed by the Nazis, for instance. Similarly, as in case of political parties and voting for them, a psychological effect plays part too, inasmuch as this connexion may cause and escalate potential perils. On the whole, above these every-day concerns, theories of neuroethics were consequently introduced. This brand-new discipline concentrates on further risks of using neuroscience together with politics. And thus, it keeps imposing queries so that new and showcase issues may be examined in this respect.

Paradoxically, simplifying just the core of political science into politics may be misleading, and moreover, in many examples neuropolitics has been inquired and adduced. There is a confusion of neuropolitics and political marketing that is very much linked to electoral campaigns and voters' decision-making and attempts to better understand and consequently influence voters' final say in the voting period. A certain dissimilarity, however, may be found in Russian.[17] The *modus operandi* of the Russian language as well as the scientific approach use the literal form as *neuropolitical science (нейрополитология)* in order to employ neurobiology within the field of political science (eg, Slanevskaya 2012).

Neuropolitics has been spreading lately even in Central and Eastern Europe (CEE). The term neuropolitics *(neuropolitika)* dominates the discourse in the Czech Republic, and technically speaking, neuropolitical science has not been adopted,

[17] Even a vast majority of other Slavonic languages stuck to the prevalent rule of English and thus have employed own translations of neuropolitics.

neither by local theorists, nor the media.[18] Similarly in Poland,[19] neuropolitics *(neuropolityka)* as a research field has been on the upgrade, since the number of social scholars and politicians declaring their interest may be provable (eg, D Czajkowska-Majewska, K Dziubka, P Winkielman, and M Migalski, B Sienkiewicz). By contrast, the same figure would be infinitesimal, if in existence, in the Czech Republic. In Germany, the traditional course of political science *(Politikwissenschaft)* is not necessarily mirrored in the neuro-x field conception either. Instead, precedence is held over a divergence between neuropolitics *(Neuropolitik)* and neuropolitical science *(Neuropolitologie)*, similar to the Russian and partly Czech examples. Whereas there is just one contribution (von Bredow, Noetzel 2009) discussing *Neuropolitologie* (pp36–39) in the German book *Politische Urteilskraft (Political Inference)*; from 2009, neuropolitics has prevailed over the other option. For the record, the Lusophone and Hispanic areas are known for the use of the term political science *(ciência política)* or *(ciencia política & politología)* in the latter case. In the neurocentury though, they both have favoured the literal translation into *neuropolítica* (eg, Cortina 2011; Díaz 2014). Amongst the aforementioned terms, even the use of *political neuroscience* has appeared (eg, Jost, Nam, Amodio, van Bavel 2014; Haas 2016; Haas, Warren, Lauf 2019). The term, however, itself implies negative connotations even more than neuropolitics, since the adjective indirectly refers to seamy practices of neuroscience being politicised in order to indoctrinate. Therefore, this term may debase this neuro-x field even before the boom. By contrast, political neuroscience also implies and functions as a representative

[18] Two exceptions may be found in the Czech case. First, *Pictures of the Mind and the Mind in pictures (Obrazy mysli a Mysl v obrazech),* an exhibition catalogue (Kesner, Schmitz 2011, p36) emphasises the rise of neuroscience and newly emerging fields, and among these, neuropolitical science could not be omitted. The latter, a diploma thesis studying further prospects of political science had mentioned the term neuropolitical science (Alekseeva 2018, pp7–9; 28–32) and it then used it frequently. In defiance of this attempt, the persisting inaccuracies within the text and oversimplifications which may be understandable due to the level of studies, the author simply did not stick to the Czech practice as seen in other works (eg, Koukolík 2010; Koukolík 2012; Koukolík 2016; Koukolík 2018).

[19] The most prominent book published in this area was written by Czajkowska-Majewska (2009). Her monograph was dedicated to the latest developments in the globalised world.

of peer-reviewed analyses, while neuropolitics has lately put down roots especially in the journalistic discourse.

Two more assumptions are to be noted. First, the English-speaking world has formed the rest of the globe in understanding and translating the appellation. Above all, it was Timothy Leary's *Neuropolitics*,[20] originally issued in 1977, that drew attention to neuropolitics as a term. Nonetheless, Connolly's work (2002) was the first comprehensive text emphasising the role of biology for understanding political phenomena (Gunnell 2012, p95). Secondly, a great majority of non-English speaking countries, in which neuropolitics has been discovered rather recently, possess relatively shorter or ambiguous experience in democratic governance and thus in political science research on democracy, respectively. For that reason, local theorists may feel the need to incline towards voguish approaches of neuropolitics a bit more, instead of seeking deeper patterns of previously analysed phenomena in order to put their region of stint on display which is meant to manifest that the local academic milieu is sufficiently mature (see also Chiao et al. 2013, p16). Neuropolitics and political neuromarketing have exhibited a wave of interest among scholars in developing countries of Latin America or India, for instance (cf, eg, Braidot 2011; Dutta, Mandal 2018; de Sena, Scribano 2020). The fact is, that these countries are not necessarily burdened with the ties of the Second World War, meaning ethical matters and consequences, even though many conflicts and wars have taken place in these territories. Furthermore, developing countries attempt to compare in science quality and objectives to the West (cf, Mason 1992; Svasti 2001). Paradoxically and out of spite then, a great amount of literature on neuromarketing currently originates in the German-written literature,[21] in which both theorists and students in their theses focus not only on neuromarketing and its practical use, but they also stress the significance of ethical questions when following and elaborating on Immanuel Kant's

[20] Timothy Leary (1920–1996) was an extraordinary psychologist whose academic interests rooted in the use of narcotics.

[21] In Italy, on the other hand, the number of scholars examining neuromarketing is much lower (eg, Babiloni, Meroni, Soranzo 2007).

interpretations whilst studying also the practical dimension of neuromarketing (cf, eg, Bittner, Schwarz 2014; Dolezal 2017; Elger 2009; Fehse 2018; Felix 2008; Häusel 2007; Pispers, Rode, Fischer 2018; Scheier, Held 2006; Stockinger 2011; Winkler 2015).[22]

Towards the end, the *behaviouralist attitude* aka *behaviouralism* shall be mentioned as a patronising approach in political science because it has modified further understanding of individual political behaviour, not in institutional settings and regimes from the late 1930s. Strikingly, behaviouralism, having its origins in the United States of America (USA), has been arguing against endeavours to examine abstract conceptions such as democracy and non-democracy, for instance (Somit, Tanenhaus 1967), and ethical queries are similarly irrelevant to behaviouralists.[23] Yet, the behavioural as an adjective has been modified into *biobehavioural* too (cf, eg, Stewart, Bucy, Mehu 2015). If this objective were to be fulfilled, however, given terminological utilisations would not be salutary.

Currently then, it has been *de rigueur* that biological elements should be essential for any research even in social sciences and this logic, therefore, follows the erstwhile one insisting on applications of statistical models without any deeper circumstances.[24] And as exemplified in this thesis, fields and disciplines akin to politics commence to utilise and even combine[25] biology and neuroscience with its own subfields to make certain that the research project appeals to the others and remains relevant for a bit

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[22] Within the given sources, there are texts dealing with neuromarketing in insurance, travelling, branding, communication and leadership, for instance.

[23] When analysing the *"behavioural creed,"* the authors summed it up into eight main clauses. Among which, in no 6, they clarify that, according to behaviouralists, so-called *"great issues"* (Somit, Tanenhaus 1967, p176) shall be completely missed out in further research, and only instances of political behaviour (such as voting) may be examined in connexion to ideology and democracy support. Alongside, the fact that moral and ethical matters are of no consequence to behaviouralists (ibid, pp177–179) seems to make behaviouralism rigid and benighted for the latest developments in neuropolitics and social neuroscience.

[24] This overuse of statistical methods in social sciences was criticised, among others, by Tony Judt who had opposed this oversimplification and the possibilities to adjust and affect the final outcome (Judt, Snyder 2013).

[25] For combining the fields into an interdisciplinary analysis, sundry approaches may be employed. In case of biolinguistics, for instance, biology and language are being analysed as a whole (cf, eg, Boeckx, Grohmann et al. 2013; Jenkins 2001; Jenkins 2004).

longer.[26] To make the issue more gruelling, biopolitics belongs to rudimentary branches of *life sciences*, neuropolitics pertains to *applied life sciences*.

For this thesis, the title had been selected accordingly in the form of *neurobiological underpinnings* as the biological route shall coincide with neuroscience and its findings in the research design (see Kragh 2002), and moreover, everything is to be applied in political science whilst studying an agelong concern of rule, governance, and non-democratic tendencies in particular.[27] A physiological trajectory corresponds to the ability and specialisation of tools employed in the pilot experimental investigation, ie, EDA and fEMG. Therefore, the thesis itself is not in line with the postmodernist approach towards biopolitics. Contrariwise, it inquires the physiological traits in order to put these into contexts of politics. While many papers have presupposed that it was neuroscience to explicate and clarify political phenomena, in this thesis, an accent would be put not only on a mutual contribution, but also on the eventualities and physiological occurrences which might be elucidated by political science. Irrespective of whether the term causes an increase in number of misleading terms, the fact is that the neurobiological itself suitably demonstrates not only the content of the presented thesis, but it also directs and highlights new perspectives of political science without being dependent on mere interpretations of biology. Whereas the neurobiological, as an adjective, is wider in scope of research and practical applications, physiology then delineates itself in comparison to behaviouralism.

[26] There are also some *false friends* in terminology. For example, *biogeography* that reversely studies biological facets of animal species using geology and geography at the same time.

[27] Initially, Fowler and Schreiber (2008) propounded the term *"science of human nature"* to patronise the field.

Research problems, questions, and hypotheses

General research questions have been arranged to be in line with each chapter later in the thesis. For the pilot experiment, there are three leading hypotheses. In the first part, the research study focuses on neuropolitics *per se*, whilst in the experimental section, the main research dependent variable is represented by physiological predispositions to non-democratic forms of government via inclinations to its leaders.[28] The independent variables, aiming to explain the former, are of political character. Specifically, that pertains to the ideological leanings and political preference in accordance with participants' social class affiliation and (non-)acceptance of democracy as the best form of government.[29] Socio-economic and political features as the certain type of education and participants' pre-election polling account for the control variables.

This non-democratic predisposition is then defined as a liaison between changes in participants' electrodermal and facial muscular activity as measured by EDA and fEMG, respectively. The corresponding indicators used for the recorded measurement amongst the pupils of grammar school (G) versus secondary vocational school (S) are as follows: the zygomaticus major, corrugator supercilii, and the skin conductance response (SCR). Therefore, this research specialises in an opportune *bottom-up* approach to political matters (Breithaupt 2003) as individuals as voters are inquired in regard to their political behaviour and decision-making, while politicians, political decisions and policy analyses are to be suppressed as a *top-down* perspective (see Fiala, Schubert 2000).

Chapter 1:

[28] Berkman and Lieberman (2011, p100) further discuss whether that type of behaviour shall or shall not be counted as a third source of primary data together with mental and neurological processes or instead, whether it shall serve as a separate variable.

[29] Strictly speaking, people taking part as examined samples may be either termed as *subjects* or *participants* in the life sciences research.

- *Were there any substantial U-turns or milestones in research of the mind and body over the periods of time up to this day?*

Chapter 2:

- *Were there any domains prevailing amongst scholars in former Czechoslovakia and later in the Czech and Slovak Republic, and why?*

Chapter 3:

- *In respect of research foci, where do the cognate fields of PPE differentiate when capitalising on neuroscience?*

Chapter 4:

- *Quantify the pros and cons: What problems and opportunities do spring from the most frequently used tools of neuropolitics?*

Chapter 5:

- *In respect of neuroethics, what is the scope of activity wherein its functional problems of existence appear?*

Chapter 6:

- *How does the human brain affect political behaviour and leanings specifically?*

Chapter 7–8:

- *Do physiological traits elicit political leanings?*
- *Do social, physiological or ideological traits elicit aberrant, non-democratic, predispositions?*
- *Are examined grammar school pupils more democratically wired in their physiological traits than the others?*

- H_1: *The participants exhibit divergent physiological traits in the zygomaticus major, corrugator supercilii or SCR when reacting to non-democratic ideology versus democracy.*
- H_2: *The participants exhibit divergent physiological traits in the zygomaticus major, corrugator supercilii or SCR in accordance with their ideological leaning.*
- H_3: *The participants exhibit divergent physiological traits in the zygomaticus major, corrugator supercilii or SCR in accordance with their social class affiliation.*

Structure of the thesis

Apart from the sections of *Introduction* and *Conclusion*, the thesis consists of nine chapters. So as to present novel findings, it is vital to become acquainted with the roots and corresponding background. Below is an overview of each chapter and its content, expectations, and contributions.

- **Introduction** has presented the scope of research inhering in the thesis when stressing the main motivations to analyse physiological aspects of political behaviour. In respect of possible confusions in terminology, this section has also drawn attention to dissimilarities in research trajectories so that the title of the thesis might be elucidated. And afterwards, the main research questions and hypotheses were stated in accordance with the methodological approach and the topics of neuropolitics.
- **Chapter 1** compares multifarious approaches towards the studies of the brain and mind from a historical angle. The chapter's purport is to contrast sequential periods with one another to show the most striking changes in understanding and making use of this connexion between the physiological and social. Albeit in a condensed form, this chapter is meant to put the issue into context from the ancient times to the 21st century, also known as the *"neurocentury"* (Farah 2011).
- **Chapter 2** draws upon the foregoing so that the roots and eminent scholars in the Czech Republic and Slovakia, formerly even in Czechoslovakia, may be identified. Following the snowball method, the goal is to emphasise and give evidence that some initial research in this interdisciplinary neuro-x field may be found in Central and Eastern Europe (CEE). Subsequently, its subchapter concentrates on research centres in this territory, thus the most distinctive realms and, at the same time, demerits of Czechoslovak research are discerned.
- **Chapter 3** builds on the previous two chapters and focuses on the emerging field of social neuroscience and its utilisation. In this regard, the thesis specialises in three diverse but overlapping directions. It is *neuroeconomics, neurophilosophy*, and

neurolaw and its main facets. Before anything else, it is necessary to realise that neuropolitics, as a complete scientific discipline, does not exist. The three out of many other neuro-x fields had been selected due to its close proximity to politics and political science. Furthermore, this relation has been even endorsed by the university curricula in the United Kingdom (UK), for instance, where politics has traditionally been studied as an integral part of *Philosophy, Politics and Economics* (PPE) courses.[30] For these studies, the methods may be employed crosswise. It is not negligible that neuropolitics has its origin in the economy-based rational-choice theory (Slanevskaya 2012).[31] In addition, this chapter maps opportunities neuropolitics has been forecasted and its reflexion in the media.

- **Chapter <u>4</u>** delves into practices of experimental political science. It details the most suitable and relevant tools in accordance with aspects one may employ in neuropolitical research. There are four main categories of tools. Whereas the first two directly map the cerebral activity, be it from a metabolic or electric perspective, the third and fourth utilise physiological techniques and instruments which may or may not be necessarily connected to the human brain at first glance. As showed in this section though, the deficiency of connexion to the brain may be misleading. After a brief introduction of these tools, major advantages and disadvantages are to be discussed in respect of neuropolitical investigations. This chapter aims to *i,* compare the wide range of tools, and also *ii,* further justify the tools selected for this thesis.
- **Chapter <u>5</u>** elaborates on both the tools and practices of neuropolitics in order to consider another salient topic, which lies in ethics. Regarding the increase of neuroscience in research, neuroethics must be examined, especially in respect of

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[30] In order to enrich these given university courses, the legal perspective has been added, since its impact on the political milieu has constantly been growing, especially if one bears in mind the electoral campaigning, its prescripts, corruption affairs and constitutional crises.

[31] The theory was expanded in A Downs' book *An Economic Theory of Democracy*, issued in 1957, in which he focused on ideological aspect of governing and voting behaviour (especially the *"voting act"*) that, according to his modelling, favours the political representatives and programmes possessing a possibility of the highest profit (Downs 1957).

political affairs and neuromarketing as a whole. The thesis draws special attention to ethics not only because it possesses a substantial role in politics and respective research, but also because [as neuropolitics] it has becoming an independently emerging realm engaging in contemporary neuroscience research practices and relations to the unforeseen challenges springing from the interconnexion of neuroscience and social sciences.

- **Chapter 6** presupposes the theoretical background neuropolitics has been based on, and it systematically develops its dominant factor, ie, political leanings, which shall be employed even in this pilot study. The theoretical side is to be enhanced by the most recent findings in this area regarding the physiological traits. After that, another needful motif in political theory, authoritarian personality and its preference, shall be discussed in the same manner as political ideology and leaning.
- **Chapter 7** provides an outline of the experimental research design. Therefore, a concrete specification of research tools will be encapsulated for facial electromyography (fEMG). This pilot experiment also contains the electrodermal activity (EDA) measurement to recognise the issue of concealed preference towards non-democratic politicians. This chapter also characterises the course of experimental investigation amid the coincident circumstance resulting in modifications in the research design.
- **Chapter 8** elaborates on the range of findings from the measurements and diagnoses the traits in respect of political leaning with non-democratic preferences.
- **Chapter 9** extends the findings from the experiment and descriptive analyses of the theoretical milieu. This chapter concentrates on limitations rooted in social neuroscience and neuropolitics and afterwards, a separate subchapter discusses the most substantial limits of this thesis.

- **Conclusion** summarises the leading findings and contributions, and it results in a debate on further prospects and possibilities for research in case of neuropolitics in the near future.

Selected methods and tools

The aforementioned and upcoming chapters and subchapters have been mirrored in respective methodological approaches. Therefore, this thesis shall be built on qualitative and quantitative research, and a subsequent pilot experiment. The first opening chapters shall describe and emphasise the longevity of scholars' interest in neurobiological underpinnings and their systematically changing attitudes. Consequently, the nascence of neuropolitics shall be characterised. In search of the Czechoslovak category of theorists and research centres taking part in this area of research,[32] the concept of snowball sampling shall be applied due to its position out of international reach for which this method is felicitous (Handcock, Gile 2011). Biernacki and Waldorf (1981, p141) then encapsulated snowballing as a method that *"yields a study sample through referrals made among people who share or know of others who possess some characteristics that are of research interest".* [33] Owing to the mutual interconnectedness of modern Slovakia and the Czech Republic, these two countries will have to be dissected together.

In case of tools that could be employed for neuropolitical research in a general sense, after its brief and practical introduction, SWOT analyses shall be presented so that all the elements or application aspects are reflected and considered for further utilisations. Notwithstanding the existence of some initial publications (cf, eg, Harmon-Jons, Beer 2009; Decety, Cacioppo 2011; Orel 2017) as manuals for various

[32] The selection was narrowed.
[33] Snowballing is also known as *chain referral sampling* (Biernacki, Waldorf 1981) or *link-tracing sampling* (Handcock, Gile 2011)

neuroscience tools in social sciences, in this thesis, the SWOT analyses are expected to shed light on expediency and appropriateness particularly for neuropolitics. SWOT analyses, as inferable from the title, examines *strengths, weaknesses, opportunities, and threats* of given strategies, projects, or tools usability, as in this case. Whereas the former two are part of internal factors, the latter two indicators are of external nature. In comparison to other instruments, SWOT functions as a *"simple tool"* (Seidl 2006, p198) that has been used from the 1950s and 1960s.[34]

SWOT analyses had been used solely for business research and planning (Chermack, Kasshanna 2007) for which it fits as the *"zeitgeist"* (Madsen 2016, p42). However, it has become a regular and popular component in the assessment methodology of not only social sciences, but academia as a whole (cf, eg, Helms, Nixon 2010; Ghazinoory, Abdi, Azadegan-Mehr 2011; Williams 2018; Hazzan et al. 2018). This universal applicability inheres in the fact that SWOT analyses are known as *"rich and prompt tools that help explore new possibilities"* (Chermack, Kasshanna 2007, p387), but more importantly, it aims to make the theorists pondering upon the information in detail, since SWOT analyses never bring information from within as it may be wrongly assumed (Kay, McKiernan, Faulkner 2006). As a consequence, SWOT analyses have been misunderstood, abused or applied in combination thereof many times (see Koch 2000). Although SWOT simplifies the data sets and it may be biased by subjectivity, as exemplified by Pickton and Wright (1998), in this thesis, the data used for the SWOT analyses will be based on already terminated and executed studies in respective fields. This section, devoted to tools of neuroscience, is not determined to merely justify two selected tools of the thesis, but also to assess these instruments in respect of suitability and applicability in neuropolitics as a feasible *third way* which would allow to break free from the dominance of electroencephalography (EEG) and functional magnetic resonance imaging (fMRI). In line with the objectives of this thesis, facial

[34] Originally, SWOT analyses have its roots in the USA and are associated with the universities of Harvard and Stanford. As Madsen (2016) notes, however, the exact origins or comprehensive studies on SWOT have never been realised, and thus the past still remains unclarified.

electromyography (fEMG) and electrodermal activity (EDA) will be employed,[35] since, at least in case of fEMG, it proved itself to be an expedient means for political matters together with emotional processing of displayed photographs (see Haas, Constable, Canli 2009; Balconi, Pagani 2015; 't Hart et al. 2018).[36]

In the aftermath of the initiation into neuropolitics, the thesis exploits the theoretical conceptions lying in non-democratic regimes, and thus it presents a more detailed case study of non-democratic predispositions in connexion to ideology.[37] Irrespective of minor criticism against human *"ideological inconsistencies"* (Martin 2015, pp5), the traditional perception of ideological leaning has constituted a key indicator in neuropolitics that allows researchers to differentiate amongst examined subjects, ie, participants, in political patterns of behaviour (Stone et al. 2014; Ahn et al. 2014). The theoretical background then explicates the origins and especially discovered personality traits linked to ideology. Since this thesis uses a pilot experiment as well, participants shall be asked to fill in a questionnaire form in which one question will specifically ask them to state the preferred political leaning, and moreover, two other questions are meant to vindicate the former query on ideology. These questions are then employed in the same form and widely accepted and used and, at the same time, widely contested (cf, Hibbing, Smith, Alford 2014a; Hibbing et al. 2014b; Greenberg, Jonas 2003). The thesis then tests the significance of ideology in Eastern Europe in comparison to the West wherein ideology does pose a weighty factor even after the end of the Cold War (see Jost 2006). At a pioneering level of this piloting study, ideology of examined participants, ie, pupils, will be put in connexion to non-democratic predispositions that shall be defined and conditioned by a positive inclination to non-democratic ideology manifested in a significant physiological

[35] EDA and fEMG as research tools are being delineated in *Subchapter 4.4 Electrodiagnosis techniques*.
[36] Vigil (2010) also adverts to the importance of displayed facial expression, since this indicator plays a crucial role in distinguishing between liberals and conservatives amongst examined participants.
[37] Due to the possible complicatedness of case studies and quantitative research itself (cf, eg, Daymon, Holloway 2002; Gerring 2007; Grigsby 2012), the author has also employed quantitative method and the experiment too.

activity. This predisposition was selected inasmuch as Arceneaux (2020, p4) had emphasised the necessity to expand upon this part of political mind. Consequently, further outcomes might be a salient indicator explaining democratic behaviour of which attributes have been set forth by sociological surveys amongst Czech pupils (cf, Kudrnáč, Lyons 2017; Šerek 2017; Torney-Purta 2017; Šerek, Lomičová 2020).

Whereas the founding chapters represent an *"instrumental case study"* (Dawson, Algozzine, pp34–37) examining pertinent surrounding effects of neuropolitics, the experimental case study interlinks the attributes of *"psychological"* and *"sociological"* case study so that specific features of human behaviour and politic might be understood (ibid). Therefore, the first part of the study, meaning *Chapters 1* to *5* and *Chapter 6* as a theoretical base, is to be executed qualitatively, whereas the second passage of the thesis, dedicated to an experiment under laboratory-conditions, is to be analysed quantitatively though the *R programming language*, and its models, and the *IBM SPSS Statistics programme*. From a methodological point of view, the former resembles the *"interpretative"* case study concentrating on the applied research, the latter, on the other hand, stands on the borders of *"hypothesis-generating"* and *"theory-confirming or infirming"* case study (Lijphart 1971, p692), whilst employing an experiment, but not in an unexplored environment.

Furthermore, bearing in mind critical comments towards the results and applicability of case studies from the beginning of its use in the second half of the 19th century, and primarily in the 1930s,[38] it still allows to deliver a *"detailed analysis of the examined unit"* (Drulák 2008, pp30–31; 33). And furthermore, the *"hierarchical arrays"* of research methods may be turned down, provided that case studies are applicable not only in preparatory phases of research (Yin 2018, p35). In defiance of complexities residing in the parallel use and liaisons of qualitative and quantitative methods, the overall conclusions shall then be more coherent and comprehensive. Consequently,

[38] The origins of case studies are associated not only with historians, but they may be dated to Pierre Guillaume Frédéric le Play, a 19th century French economist and sociologist (Drulák 2008, p30).

the characteristics of *"multimethodology"* are to be accomplished in the text (Gillham 2000, p13), and thereby symbolising an interdisciplinary procedure of research.

Literature review

Neuropolitics is a very narrowly specialised, and thus limited and complex, sector of research, and for that reason scholars mostly label their research by the term *social neuroscience* or even more frequently by a hypernym *cognitive science*.[39] For that reason, even the out-of-the-ordinary character of this neuro-x field has been mirrored in the academic literature. It is not only the lower quantity of research, but also its fragmentation, since articles on topics of neuropolitics and neuropolitical research-resembling studies may be found across myriads of journals with sundry research foci. Moreover, from the outset of debates flirting with the idea to employ the tools of neuroscience for originally social science-oriented research projects has sparked off heated debates with rather mixed results (Krastev et al. 2016). Researchers may be divided into three corresponding categories as *optimists, pessimists,* and *realists* in accordance with their attitudes towards neuropolitics and its further application possibilities. Whilst optimists (eg, Zurawicki; Pradeep) are reflexed in enthusiasm to make use of neuroscience in neuropolitical and neuromarketing research, pessimists (eg, Butcher; Levy), by contrast, emphasise the problematic character of neuroscience as a *"neuromythology"* (see Littlefield, Johnson 2012; Ortega, Vidal 2016, p966) in application attempts as well as the complexity of utilisation in political science and ethical consequences.[40] A restrained attitude has persisted

[39] This phenomenon manifests itself in the *Google Scholar* lists of researchers in neuropolitics wherein there are only three other researchers claiming allegiance to this field specifically. The figure has been valid up to January 2020.

[40] There are, however, many other unfavourable labels, such as *neurospeculation, neuromadness, neuromania, neurotrash, neurobubble,* etc. (cf, eg, Legrenzi, Umiltà 2011; Littlefield, Johnson 2012; Ortega, Vidal 2016).

amongst social neuroscience practitioners with interdisciplinary or at least psychological background (eg, Cacioppo; Decety; Schreiber). Amid these contradictory points of view, realists endeavour to analyse and bear in mind both the theoretical foundations and, at the same time, experimentational investigations.

When discussing the main contributing factors for the genesis of neuropolitics, Hatemi and McDermott (2012) stressed the importance of political psychology. Political psychology was the first to practically bring together the biological side with politics (see Hughes 1975). When bearing in mind the literature on neuropolitics and its character, however, it is necessary to consider the growth of social neuroscience as it sprang up in the last decade. Owing to *The Oxford handbook of social neuroscience* (2011), a widely recognised book, Jean Decety and John T Cacioppo,[41] both working at the *University of Chicago*, have become known as the founding fathers of the field of the same name. In a juxtaposition, Figure 3 illustrates the mentioned increase in research papers focusing on social neuroscience which had escalated in 2006 when *Social Neuroscience* and *Social Cognitive and Affective Neuroscience* were established.

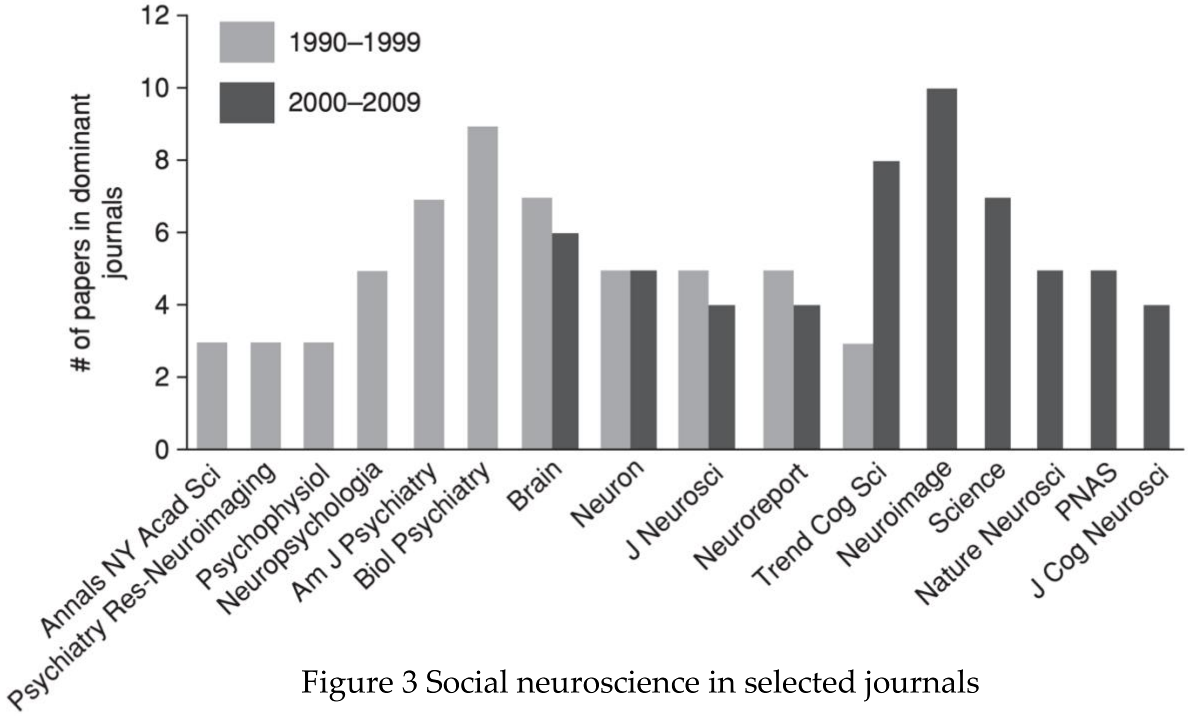

Figure 3 Social neuroscience in selected journals

Source: Matusall et al. 2011, p20

[41] John T Cacioppo has died unexpectedly in 2018.

Although these two are amongst the main prominent peer-reviewed journals in this area, themes of social neuroscience have appeared in many other journals, such as *Cognitive Neuroscience, Cognition, Social Cognition, Journal of Experimental Political Science, Journal of Research in Psychology, Neuroscience and Neurophysiology, Quarterly Journal of Experimental Psychology, Journal of the International Neuropsychological Society, Behavioural and Brain Sciences*. This facet then complicates efforts of any comprehensive analysis. Yet *Politics and the Life Sciences*,[42] as the only peer-reviewed journal *a priori* interconnects politics and biology as its main research focus.[43]

In neuropolitical research, there are three main researchers that may be discerned. First, it is John T Jost who works in tandem with David Amodio at *New York University*. Secondly and more importantly, it is Darren Schreiber, currently working at the *University of Exeter*. While Jost and Amodio are associated especially with the experimental type of research, Schreiber's work covers both theoretical and experimental papers. In this place, another arising feature of neuropolitics must be emphasised. Neuropolitical research studies are of two-kinds inasmuch as primary research project and secondary research may be identified. The former one looks back and thus concentrates on the dependent variables from the scratch, for instance, as put forward by scholars in the past centuries, whereas the latter elaborates on these findings and sets new trajectories of investigation (cf, eg, Verhulst, Eaves Hatemi 2012; Hibbing, Smith, Alford 2013; Devenport, North 2019).[44]

The initial problematic aspect of neuropolitical research lies in scientists themselves. Apart from Schreiber who had previously graduated in law, a vast majority of researchers came from the fields of psychology or neuroscience. And in their papers then, there are certain inaccuracies which be might be disputable in

[42] The journal has been issued on a biannual basis from 1982.
[43] Among the Czech journals, only *Sociální studia / Social Studies* issued a 2015 special edition dedicated to experiments in social sciences, albeit not specifically in politics.
[44] In this respect, it is needful to mention a special edition, *Research in Biopolitics*, that has been issued by the *Emerald Publishing* from 2011. Under the editorship of A Somit and S A Peterson, researchers concentrate on manifold areas of research in biology and neuroscience in connexions to the human behaviour and patterns.

political science. Morey (2017), for example, put an utmost accent on televised political advertisements as the crucial indicators differentiating between the memory abilities of conservatives and liberals.[45] Questionably, the author did not even consider that there are samples of people who would not regularly watch these spots, or similarly, there are other means of political campaigning such as billboards or canvassing (see Kramer 1970; Gerber, Green 2000). Nevertheless, this study is in accord with Sartori's concept of *"video-politics"* which stresses not only the power of videos, but also two salient processes: *i, "how to be political"*, and *ii, how to manage politics*" (Sartori 1998, p66).[46] In addition to that, the complexity of campaigns and politics itself reside in the fact that they are based on coincident events which deeply affect the final political decision and behaviour. Then some aspects of politics are either omitted or not sufficiently accented due to the necessity to simplify the political reality for the scanning procedures. Oxley et al., as they noted (2008, p1667), used the total of 46 participants *"with strong political [ie, ideological] beliefs"*. At first, the analysis is lacking in explanations what did these beliefs stand for and how was this variable measured. Secondly, this project took place in the United States of America where the partisanship differs in comparison to the rest of the world (see Gries 2014). And more importantly, it exemplifies the problem of portability and the findings generalisation outside the USA. Notwithstanding clear similarities between the USA and other English-speaking countries, other regions and the Continent, as divided into the West and East, indicate the overall impracticability.

When studying ideology as the prime variable eliciting differences in the human brain and political behaviour respectively, Ludeke and DeYoung (2014, pp319–320) raised a valid objection that studies lack in addressing *"general political attitudes"*, but instead they only analyse ideology in a strictly economic conception. This situation

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[45] Liberals and conservatives as appellations are mostly used in the USA, while left/right-wingers, standing for the right/left orientation, prevailed in Europe (Koukolík 2012, p45). All the aforesaid terms are used interchangeably in this thesis though.

[46] When analysing the *"homo videns"*, Sartori (1998) acknowledged the importance of videos in both liberal, ie democratic, countries, and also in dictatorships.

is most probably caused by the need to reduce the political milieu for experimental investigations or questionnaire surveys. And it is even highlighted by the above-mentioned problem with scholars' academic background. By contrast, the need to simplify the biological information and data sets together with the real abilities of the tools of neuroscience has persisted among social scientists and neuromarketing practitioners. In the aftermath of these endeavours, there are statements, such as *"EEG shows the brain activity"* (Zurawicki 2010, p48) or the meaning of *"invasiveness"* in respect of tools (Brinkerhoff, Straehley 2015), which would be neither really correct nor satisfactory in the praxes of neuroscience. Misleading or even fallacious claims as these two then result in pipe dreams of the omnipotence neuroscience might have, and on top of that, it even amplifies the gap between the optimists and pessimists in social science-oriented neuroscience (see also Haynes 2011). Finally, brain scan images may be perceived as a means to make the readers or other social scientists flabbergasted, the fact is, nonetheless, that the *wow effect* of scan imagines usually turns out to be offset by the interpretation consequences. Not only it is very demanding but its value, after all, may be poor as a research outcome, since social neuroscientists and even neuromarketing practitioners are not necessarily used to work with the physiological data on a regular basis. Likewise, these scan images may struggle to address a basic query of methodology, asking *So, what?* leaving its scope of activity blurred.[47]

Tardily, the greatest geographical and so the research foci dissimilarities, which had been observed by Schreiber (2017), have been slowly fading away. And regardless of researchers' country of stint and/or origin, scholar and their student keep adding more biological and physiological aspect in their papers or theses (eg, Lavarda 2011; Houdek 2016; Carvalho da Fonseca 2017; Alekseeva 2018). Yet the dominance of American research studies has endured (see Hibbing et al. 2014b). Furthermore, owing to the increase and spread of publications and papers pondering upon the connexion

[47] Instances of brain scan images may be found in the analytical section of this thesis. Amongst given examples, there are images depicting the participants in the course of voting, reactions of Italian voters to PM Silvio Berlusconi, or scans illustrating the differences between liberals and conservatives.

between politics and biology in the 2010s (eg, Blank, Hines Jr 2001; Lloyd 2008; Hatemi, McDermott 2011; Starks 2019; Tibayrenc, Ayala 2016; Willey 2016; Peterson, Somit 2017), borders of neuropolitics have been subsequently raised. [48]

Alas some texts (cf, Močkor, Müller 2017) only climb on the bandwagon of neuro-x fields, implying that biology must have been referred to as a voguish feature while no consideration of deeper understanding of the consequences, nor implications came into existence. And in the aftermath, this type of shallow research may never provide sufficient innovations in research.

[48] For instance, Marcus (2012b) also initially endeavoured to draw attention to the very basic liaisons between political science, and its main research foci, and psychology and other facets of biology.

1 ON THE ROOTS OF RESEARCH

Formerly, there used to be a vast range of various and dissimilar approaches being employed by philosophers, political theorists and other scholars (Meloni et al. 2018). In this chapter, the principal theorists are being characterised in respect of their connexion to the study of biology and humanities, respectively.[49] Afterwards, the chapter aims to briefly contrast the divergences taking place in the course of time up to the present day. Overall, four elemental periods of distinctive shifts and approaches towards biological underpinnings of the human mind and behaviour may be identified, and these are as follows: the ancient comprehension, followed by the era from the Middle Ages to the Enlightenment, the sequence up to the course of the long 19th century, and finally, it was the petrifying 20th century. This classification, however, cannot be comprehensive (cf, Serafini 1993; Rádl 2006). By contrast, Esposito (2008) clustered all the aforementioned historical period into one that had ended by the Second World War. Thereafter, he identified the second but modern wave of biology-based research in France in the 1960s. According to Esposito (ibid, pp19–22), the French scholars endeavoured to determine this type of research,[50] and thus break away from the Nazi past. Finally, the third, and still ongoing, wave has been associated with Anglo-Saxon scholars. Specifically, a new platform for shared research in biology and politics was introduced within the *International Political Science Association* (IPSA) in 1973.

Therefore, when seeking after the primordial origins, one must seek in the ancient *"natural philosophy"* as Churchland (2002, pp5–6) exemplified,[51] in terms of the era taking place between 600 BCE and 200 CE. This period is associated with a trio of

[49] The objective of this chapter is to outline the most striking shifts and main founding savants in given epochs. There are, indeed, many other theorists who could not be included and, at the same time, the content of given scholars' work will have to be reduced in length due to the extent requirements.
[50] A distinct approach may be found in the Italian case (see Chiesa, Toscano 2009; Righi 2011).
[51] Gray (2010, p639), however, went even further when analysing the role and position of the mind, soul, and body in the Hebrew and Christian religious texts. By contrast Subramaniam (2019), for instance, focused on the neuroscientific facet in Hindu nationalism.

thinkers: Plato, St Augustine, and St Thomas Aquinas.[52] Plato, however, was a forerunner in a dualistic interpretation of the human mind and body. In his dialogues, the human mind was divided into three parts. The human mind *per se* had been seen as *"(…) pre-existent, immortal, spiritual substances trapped inside bodies"* (Gray 2010, p643).[53] The same view had been shared by the other above-mentioned scholars of Christianism, who followed Plato's categorisation of the human mind into three sections, ie, *sensible, rational, and emotional* (Churchland 2002, p6). Moreover, both Plato (2000) and Aristotle (2000; 2003) assumed that there were people predetermined to rule and obey (Peterson, Somit 2017, pp3–4). Even though some sections of Plato's philosophy, eg, the divine and immoral component, are not acceptable by modern philosophers who tend to monism, one argument stands out significantly when querying: *"Is the human body a mere instrument of the mind?"* This question of interconnectedness between the body and mind has persisted even in the 20th and 21st century (Polák 2013, pp38–39).[54] Overall, philosophy has always inclined to understand the way of acquiring the knowledge. And even if one realises that some of Plato's thoughts remain valid, the neurons' general unpredictability keeps making (neuro)philosophy difficult (Churchland 2007, p236).

Unlike other scholars, and Plato in particular, Aristotle's theories varied in a stricter approach towards methodology in which philosophy served as a means to foreground the magnitude of physiobiological underpinnings (Keeley 2009, p229).[55] Aristotelian perception of biopolitics, as Esposito (2008, p14) observed, had put an accent on the *zōē*, meaning the physiological life *(tenuta)* which contrasted with the *bíos,* ie, the qualified life. Esposito notes that the reciprocal liaison of these two terms cannot be

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[52] The list may be enriched by adding, for instance, Theophrastus, Democritus, Hippocrates or Galen (Keeley 2009, p228; Rádl 2006, p58; Gerber et al. 2010).
[53] Polák (2013, p37) also stressed the human mind's divine character.
[54] Similarly, Hill (2005, p55) summarised that many parts of Descartes's work have been falsified. Moreover, he claimed that Descartes is currently mostly *"overinterpreted"*, and thereby causing chaos in understanding of his work.
[55] Yet Aristotle should be perceived as an *"independent Platonist"* (Tipton 2014, p10), at least at the early stages of his life.

plainly defined though, and even the traditional likening to *bíos politikos* will not be able to sufficiently clarify the relation between the body and politics. And although Aristotle had never really examined the human brain, notwithstanding his deep interest in medicine (see Crespo 2017), his dicta regarding the human behavioural patterns have been both verified in terms of *neuro-Aristotelianism*,[56] eg, the existence of the mirror neurons, and falsified as well (cf, eg, Thiele 2012, pp128–130; Lewis 2012).

European mediaeval decades were affected by the prominent role of the Church and therefore, any research of this kind had been rather limited and with *"relatively little progress"* (Serafini 1993, p55). Yet, it would be incorrect to assume that there was none at all. In many cases, theorists influenced by Christianism followed and expanded upon the work of above-mentioned ancient philosophers. And this fascination with ancient philosophy endured even to the era of Immanuel Kant (Plamper 2015, pp16–18).[57]

Notwithstanding the appreciated contribution of Thomas Hobbes in this field, the work of René Descartes has caught researchers' attention more conspicuously (Easton 2012, p74). And whereas mediaeval and ancient scholars believed that biology, including psychology too, had been the only and supreme science, Descartes and Galileo Galilei reversed this view in favour of physics, chemistry, and astronomy (Rádl 2006, p67). Descartes, a representative of dualism, studied the human mind from a philosophical angle as well as from the then physiological one. According to his theory, there were three fundamental pillars accounting for this area. These were the *mind and body* as two separate units, followed by *mental states*, and finally, *consciousness* and its states (Polák 2013, p40). Although Descartes's work emulated the patterns of Aristotelian philosophy of dualism,[58] he distinguished himself from the premodern

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[56] Neo-Aristotelianism also manifests itself in the studies focusing on soul, *psyche* (Gillett 2018).
[57] Great many scholars have then used biology as an indispensable element to support their claims. For instance, J J Rosseau used it for *The Social Contract* (Peterson, Somit 2017), so did E Burke in case of debates on reason (Ryan 2001), and T Hobbes on subjectivity (Martel 2012).
[58] Descartes's presumptions are, as in case of Plato's, based on the immortality of the mind, and on top of that, the omnipresence and might of God (Connolly 1993, p22).

thinkers in certain aspects. For instance, consciousness he has been associated with due to his separation of the *res cogitans*, humans as *thinking items*,[59] and ensuing thoughts as products (see Bennett, Hacker 2003, pp25–26). Most importantly, Descartes believed that *cogitare* was an antithesis of *sentire* (Hill, 2005, p59). Therefore, the human mind, he believed, had two sides. On the one hand, it was a vegetative mind, and on the other hand, there was a sensitive one (ibid). In the case of impartibility of mental substance, Descartes attempted to justify dualism, thus having the mind understood as a *nonphysical* unit (Churchland 2002, p6), by the fact that the *"tangible may be separated (…) whilst the unsubstantial cannot be separable"* (Polák 2013, p45).[60] And finally, In *Le traité de l'Homme*, Descartes turned away from Aristotle and Galen's theory that had been based on the assumption that psychical impetuses originated in the ventricles. Instead, Descartes used the term *"animal spirit"* to elaborate on human bodies in order to claim that the corpuscles had its origins in the ventricles (Bennett, Hacker 2003, p27). Rádl (2006, p67) came to a conclusion, however, that not even the work of Descartes could be compared to the overall influence of Aristotle's dicta.[61]

An influential group of philosophers, whose contributions have impacted on the world of science and philosophy, is known as the movement of *German idealism* or *classical German philosophers*, ie, I Kant, G W F Hegel, F W J Schelling, and J G Fichte (eg, Cohen 2009; Kant 2008), notwithstanding the fact that Germany as such had not existed by that period time.[62] Each of the aforementioned theorists represented a unique approach, however, they shared the rudimentary underpinnings in Platonism (Démuth, Rušinová 2019, pp9–11). Subsequently, in the 19th century, neuroanatomy

[59] Thinking and thoughts had been very difficult to be defined by that times of Descartes, and for this reason, he rather used the term *mental acts* or *judgements* to substitute and paraphrase thinking as such (Glombíček 2005, p51).
[60] The nonphysical mind and physical brain, according to Descartes's belief, communicate through *"very fine material in the pineal gland"* (Churchland 2002, p9).
[61] Aristotle's original propositions were directly reflexed, for instance, in the works of G W von Leibniz (Rádl 2006, pp67–68).
[62] Classical German philosophy may be dated to the intermezzo of 1780s and 1830s.

and neurophysiology of the brain were definitely in its heyday (Bechtel 2009, p31), which then led to a rise in scientific interest in the human brain and skull in particular through the field of *phrenology*. This pseudo-science served as a salient component for ensuing racial classifications (Mosse 1985, p27).[63]

In this respect, another and infamous perspective in this area pertain to the Nazis and their ideology of cleansing, underpinned by racism and Darwinism (see Proctor 1988; Aly, Chroust, Pross 1994; Weindling 2004).[64] Having the archives opened and new discoveries delivered as well, the misuse of biology for Nazi political purposes still represents a pivotal theme in research (Karenberg 2006). Although eugenics and racial prejudice has been persistent in science for centuries, A Hitler's regime developed the execution of racial matters dreadfully. The fact is, however, that German scientists had already elaborated on racial issues in the 1920s,[65] meaning before Hitler came to power and had the *"Nazi ideology put into practice"* (Weigmann 2001, p872).[66] In addition, scientists played a key part in formation and realisation (eg, Kater 1989) so that they were able to prove more or less known aspects of human body functioning (Konopka 1992, pp17–18; Proctor 1992, p24). Despite two significant codes of ethics being already imposed in Germany, scientists and physicians[67] were allowed to avoid it in case of certain groups of people, such as the Jews, Slavs, homosexuals, criminal offenders, etc. (Cohen Jr 2010, pp689–690). At the same time, Proctor (2000, p344), when pondering upon the barbarity of some Nazi physicians, also foregrounds that in the context of science, this era shall be associated with new medical discoveries and, for instance, even organic farming and botanical gardens.

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[63] Meloni (2016, pp67–68) remarks that eugenics and its goal to improve genetic codes via crossbreeding played a distinctive part in the period of 1900–1945. The roots of eugenics may be seen in the works of Plato, for instance.

[64] Necessarily, Darwinism in social and political matters cannot be linked strictly and exclusively to the Nazi regime though (cf, Juárez-Barrera, Bueno-Hernández 2017).

[65] As for instance, E Baur, E Fischer, and F Lenz (Weigmann 2001, p872).

[66] Homonymous to the title, Müller-Hill (1988) characterised the Nazi science as a *„murderous one"*.

[67] Hitler himself used to be acknowledged as the *"great doctor of the German people"* (Proctor 1988, p64).

In a *new* post-war Europe (see Meloni 2016, pp136–138), Foucault's pioneering work, as it was already mentioned, had been dedicated to the conceptions of power which he attempted to revive from its original Renaissance form to the modern era whilst fusing it with medicine and economics (see Adorno 2014, p98; Foucault 2008).[68] Within American philosophy, it is W E Connolly who has been associated with papers and books overlapping political philosophy and biology (see Connolly 2002; Connolly 2011). In his notable book on neuropolitics, he connected science to the practice of democratic politics in term of eventualities of participation. Finally, he concluded (2002, p152) that *"(…) in a fast-paced time when speed compresses distance, a plurality of interconnected sites of democratic action must be activated if ordinary people are to have a hand in shaping the working conditions, educational possibilities, forms of identity, income levels, ecological environment, border relations, and citizen entitlements available to them".* In respect of deliberative democracy and neuroscience, it is necessary to bring together both sections of findings, ie, neuroscientific and socio-political ones, because otherwise further developments of deliberative democracy might remain only *"in theory"* (Sokolon 2012, pp217–218).[69] Hegazy (2019, p13) prioritises an opposing attitude whilst highlighting the negative impact of political neuromarketing on the state of democracy.

On the whole, there are two *"matrices"* of research as Esposito (2008, p22) claimed; one is being founded upon *social Darwinism* and evolution, and the other one follows the 1930s German roots of *ethological* bases. Both of them, however, are interlaced with troubling difficulties and obstacles (cf, eg, McGranahan 2017; Smith 2002). A summarising scheme, as adopted in Figure 4, was delineated by Gray (2010), who pointed out the differences in objectives in regard to various disciplines. Nonetheless, further precision and specialisations in neuro-x fields may disrupt this traditional

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[68] A relevant comment on the issue was presented by Franěk or Diprose and Ziarek (2014; 2018) when comparing Foucault's work with H Arendt's interpretations.

[69] Furthermore, democracy is basically a new-fashioned type of regime, especially in comparison with many previous forms of non-democratic settings, as Somit and Peterson demonstrated (Blank, Hines Jr 2001).

classification in the near future (cf, Schreiber 2007; Meloni 2014; Núñez et al. 2019). As Weigmann (2001, p874) remarks though, it is necessary to realise that science, apart from searching for the *truth and not values*, will always be contingent to ethical prerequisites and consequences in order to avoid any recurrence of atrocities committed by the Nazis.[70]

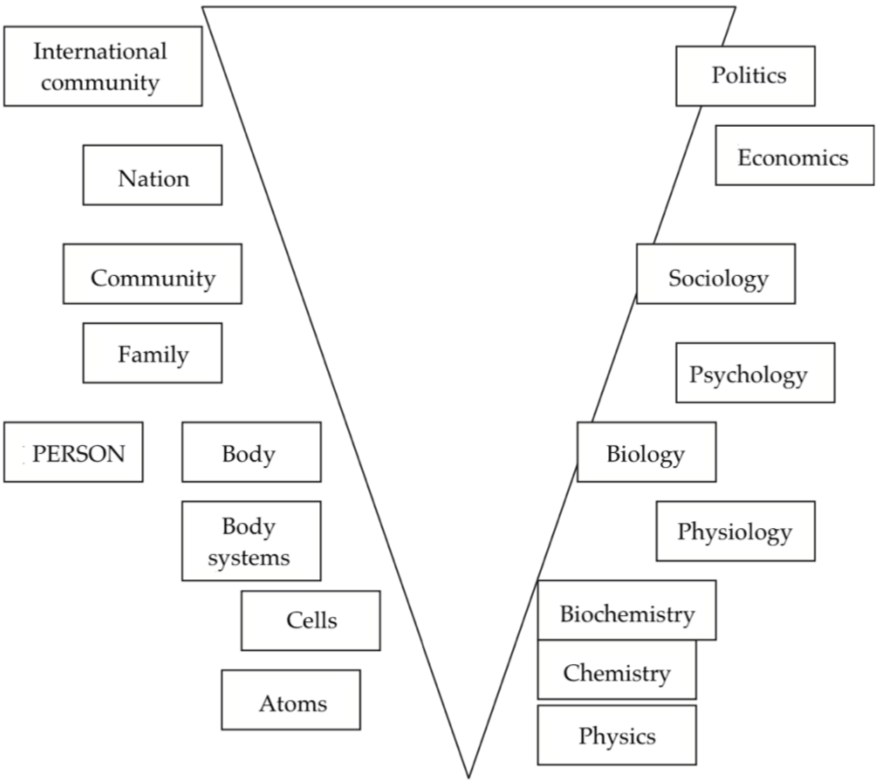

Figure 4 Levels of analysis
Source: Gray 2010, p642

[70] Controversial decisions of G W Bush, which had led him to approve of the use of torture after 9/11, the terroristic attacks taking place in 2001, have both extended in some aspects and, at the same time, terminated this short and yet petrifying century (see O'Mara and Schiemann 2019).

2 CZECHOSLOVAK OFFSETS

Compared to the previous chapter, stressing dissimilarities amongst antecedent epochs with great many scholars, there is quite a limited number of theorists that could be examined in the Czech Republic. Research studies on biology and politics and the corresponding debate have been conducted by a small number of scholars. There used to be only philosophers who have pursued biological and medical themes. However, the number of scholars was also restrained,[71] and moreover, a vast majority of knowledge had to be based on translated texts of Soviet authors who had put forward their presumption under the influence of Marxism-Leninism (Kuře, Petrů 2015, p43). It is necessary, however, to realise that the Communist era, in power in Czechoslovakia from 1948 to 1989, shall not be the only to be blamed for the deficiency in the amount of theoretical and analytical papers. Even though the *ancien régime* had abused attributes of social sciences and usurped its means in favour of the red ideology (see Oates-Indruchová 2008; Petrov, Ryazanova-Clarke 2015), the first modern scholars of the 20th century who have been in possession of the knowledge of interdisciplinary courses of biology and philosophy occurred as two out of three founding pillars in the country.[72]

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[71] According to Kuře and Petrů (2015, p89), no medical, ie, biologically oriented, philosophy had been produced whatsoever in Czechoslovakia, nor in the Czech Republic, in the 20th century.

[72] Additionally, it is crucial to emphasise Emanuel Rádl, born during the reign of the Austro-Hungarian Empire, who was an eminent and world-famous biologist and had studied and focused on philosophical aspects of science, too. His most highly appraised book on the history of biology has been translated into several languages and reprinted in Czech in the 2000s (see Rádl 2006). After the Great War, Rádl (1919) had his special lecture on democracy issued separately. In this text, Rádl examined the roots of democracy, and in addition to that, he emphasised the role of science which should have been democratic in terms of its inner character, as observed in the work of C Darwin, J S Mill and A Smith, in order to constitute a pillar of a stable democratic country (Rádl 1919, p12; p17). In fact, his work, and the history of biological theories specifically, are of *"particular relevance for many reasons"* as Bizzo (2004, p126) ascribed. Especially, it is Rádl's meticulous analyses of Darwin, Mendel, and Lamarck's work, followed by highly sophisticated research methods (ibid, pp127–130). Rádl's work is also known for its recurring sceptical and highly critical stances against dualism of, amongst others, J Locke and I Kant (Havlíček 2005, pp279–280).

These two theorists, Ladislav Kováč, a Slovak biochemist, and Zdeněk Neubauer, a Czech biologist,[73] have met the criteria to understand and apply the biological processes to sundry facets of humanities and social sciences such as philosophy, art, sociology, and politics.[74] It is, therefore, imperative to consider the research outputs in terms of Czechoslovakia at first, since the mutuality of Czechia and Slovakia mirrors in Kováč and Neubauer's communication and work, respectively. Notwithstanding significant differences between the work, lives and attitudes of these two, it is necessary to appraise their contribution as respected and internationally recognised scientists. A great amount of their work had projected in the reciprocal correspondence the scientists had kept from 1975 to 1990,[75] amid the period of normalisation which Kováč labelled as the *"Dark Age"* and then likened to the era which had followed after the 1620 Battle of White Mountain (Kováč as quoted in Kováč, Neubauer 2019, p428). Apart from researchers' notes on new discoveries in the world of science, they strongly supported one another, regardless of frequent disagreements. Interestingly, in their letters, they both used politics in three manners: *i,* as an analogy to elucidate biological processes when, for instance, Neubauer (ibid, p80) delineated the modern natural procedures as of the form of *democratic centralism*, formerly prioritised in politics by Vladimir I Lenin, which then led to a vacant [ie, lacking in values and meanings] character of democratic ontology. By contrast, *ii,* it was a main topic which may be clarified by biology when afterwards, they discussed the wicked role of mythology and especially that *"pellucid"* ideology in science. And regardless of the absence of chances to verify or falsify them, they should have been

[73] Zdeněk Neubauer (Jr) shall not be confused with his father, Zdeněk Neubauer (Sr). Whereas the first one (1942–2016) had read philosophy and biology, the later one (1901–1956) remains well-known thanks to his research into statecraft and constitutional law after connecting political philosophy to law.

[74] Except for the trinity of leading scholars, some germs of this connexion may be found in the work of Helena Haškovcová a Stanislav Komárek. Albeit educated both in biology and philosophy, the former dedicated her work to medical ethics and thanatology (eg, Haškovcová 2007; 2015), the latter focused on history of biology, and he has published several books of political essays (eg, Komárek 2015; 2017).

[75] Kováč (Kováč, Neubauer 2019, p433) explains that their communication was stopped due to different routes these two preferred after the Velvet revolution, and Kováč disapproved of Neubauer's influence over President V Havel.

"respected as a subject of cognition" (ibid, pp84–85). Finally, *iii,* as the then constituent of societal discourse which they subjected to philosophical or physiological questioning. Neubauer, for example, declined the *res cogitans* of René Descartes and instead, he endorsed the *polarity* when analysing the movements of substance, be it in chemistry or social classes. Nonetheless, he particularised that the modern understanding cannot be based on *soul and life,* but rather *consciousness and responsibility* (ibid, p130). Cognition as a process was then analysed by Kováč who proposed to modify and reverse Descartes's formula *cogito, ergo sum* the other way around into *I am, therefore I think* so that it reflexed the physiological underpinnings.

Kováč (2007) elaborated on the interconnexion between animal physiology and ideology in his book *Natural history of Communism: Anatomy of a Utopia* in which he has identified two phases (*"ortototalitarianism" & "paratotalitarianism"*) that elicited the rise of communism. With regard to ideology, he states (2019b) that there are two types of world everyone lives in, and it is the *real* and *spiritual world,*[76] and its presence is indispensable for democracy. According to Kováč (2007, p79), democracy has survived as a *"biological species"* conditioned by the surroundings. Therefore, communism and Nazism as state religions would have managed to endure only in the Middle Ages (ibid, p158). Otherwise, communism may be compared to a mere form of experiment (Kováč 2019b, p1). By contrast, Esposito (2008, p112) adverts to the fact that the Nazi and communist ideology cannot be perceived alike, since the Nazis had employed the *"vision of biology"* differently and frequently in a perverse way.[77] Needless to say, Kováč (2007, p204) also contributed to the abovementioned debate on the banality of Evil which he ascertained only amongst individuals, not at the institutional level. By analogy to Kant, Kováč also expounded *"Lenin's categorical imperative"*, which had implied the occurrence of morals if the act does good to communism (Kováč 2007, p61).

[76] The spiritual world conditions the existence of *"spiritual foundations of society"* (SFS). Its decrease consequently results in a growth of the number of illiberal democracies across the world (Kováč 2019).
[77] Biopolitics in the Nazi regime had been based on racism, and as Esposito (2008, p112) summarised, there used to be two crucial functions of racial biopolitics: *i,* to kill some; and *ii,* to keep alive some groups of selected people.

On the other hand, one of the most recent books of Kováč (2015, p121) was focused on the contemporary level of human evolution.[78] In this societal summarisation, he opposes the *"traditional philosophy"* of the West which has been based on the concept of *eternity* and sustainability that the scholar did not find defensible.[79] At the same time, as a gold thread across the work of Kováč, there is the issue of religion and spirituality as a key factor affecting society. In accordance with biological beliefs, he propounded, amongst the Torah, Bible and the Quran, the new *"Scripture"* to idolise as he previously labelled the *DNA sequencing* (Kováč, 2010, p815). Although Kováč, as a biochemist, recognised the relevance and underfunding of social sciences, he forthrightly compared its level of knowledge to chemistry at the turn of the 18th and 19th century (2007, p196).

The third scholar, František Koukolík, represents the mixture of these two realms as a neuropathologist. In his books (eg, 2012; 2016a; 2016b; 2018), he has popularised psychology and psychiatry when studying aberrant, ie, pathological, patterns of human behaviour.[80] And Koukolík's publications functions as simplified minor meta-analyses. He has often used the political analogy to explain physiological processes. For instance, his work has been associated with the concept of *social brain* of which genesis he had conditioned by two types of evolutionary duress: *"the unpredictability of human behaviour"* and *"arms race"*, meaning the social competition in the process of socialisation which he then made dependent on the need of social hierarchies, ie, differentiating social statuses (Koukolík 2016a, p39; p239). The social brain appeared even in the papers of Kováč, who pondered upon it in respect of the youth. This social group has been, according to him, negatively affected by modern technologies, such as the Internet and social networking as Facebook, Instagram and

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[78] Frequently, Kováč reacts to the current scientific discoveries and updates which he puts into context and historical narratives (see Kováč 2014; 2019a).

[79] An essayistic continuation of his work on the value and meaning of human life may be found in Kováč (2018).

[80] An endeavour to analyse pathological aspects of humans resulting in Evil may be found in Payne's book (2005), who himself works as a physician and philosopher, too. The book's predominant orientation, however, got stuck in a theological and ethics considering perspective.

many others. As a consequence, abilities of social brain have been experiencing a downturn (Kováč 2013, p294).

When taking into account deviating forms of behaviour, Koukolík stressed the togetherness with politics. In this context, he emphasised the role of the *"Dark Triad"* (Koukolík 2018, p85) symbolised by the *subclinical psychopathology* (ie, anti-social behavioural traits), *Machiavellianism* (implying cold and manipulative attitudes towards the questions of morals), and *narcissism*. Subsequently, these three mirror in the state of *obsession with power*, which Koukolík related to stupidity[81] and the nascence of individuals afflicted by deprivation (Koukolík 2018, p105).[82] In his study on the genesis of communism, Kováč (2007, p63) ascertained that individuals showing signs of pathological behaviour were given a chance to obtain political powers due to a formation of a new and particular individuality in the social system functioning as *"modern shamans"*.[83] One of Koukolík's publications (2012) attempted to encapsulate the then psychiatric and neurological studies on political decision makings and behaviour.[84] Importantly, he compared the animal behavioural traits to human beings and exemplified the individuals going with the flow. This *"common herd"* patterns which have already been analysed in the theory of politics (cf, Ortega y Gasset 1932; Arendt 1973) are cerebrally associated with the ventral striatum, located in the basal ganglion (Koukolík 2012, pp18–19). Afterwards, he applied the *"Dark Triad"* to politicians, and in addition to that, he concluded that there was no rationality behind politics when studying the voter behaviour and politicians (ibid, pp191–192).

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[81] Nevertheless, stupidity is meant to be understood as the lack of feedback between deeds and the environment (ibid, p105).

[82] He coined a specific term (the *"deprivant")* to characterise a person with deprivation problems, thus in need of regular social, psychological, and biological abilities. For that reason, those individuals defy and are beyond the average of normality (see Drtilová, Koukolík 2011).

[83] Accordingly, Kováč (2007, pp62–67) divided the communist society into three groups: *realistic pragmatists*, communist intelligentsia which he labelled as *"affectuals"*, and *pathologically disrupted* individuals. Afterwards, Kováč specified that the citizens' need of a strong leader had been intensified in communism so distinctively that it even surpassed the Führer regime in Germany.

[84] Albeit in a smaller scale, political decision-making may be also found in his 2016 monography (see Koukolík 2016b).

When considering the contemporary generation of biologically and experimentally oriented social scientists in Czechia,[85] it is necessary to mention two pioneering theorists (Hrbková 2014; Hrbková, Chytilek 2015). They focus, among other topics, on political behaviour in respect of voting patterns (cf, eg, Chytilek, Tóth 2017; Tóth, Chytilek 2018). In their research studies, however, biology has been treated as a secondary constituent serving as a foundation base for experiments. Similarly, as in case of other undermentioned Czech research centres, Chytilek and Hrbková adopt the discoveries of biology and through these they implicitly interpret their data sets and findings (see Chytilek et al. 2014; Hrbková, Zagrapan, Chytilek 2017).[86] In Slovakia, distinctive contributions to the field are attributed to Andrej Démuth. His research, however, does not include political topics, instead he has dedicated his work to the processes of cognition as viewed from a philosophical and theological angle (see Démuth 2003; 2009; 2019).

Overall, there is currently no institutional patronage for physiobiological and neuroscience research that pertain to political behaviour and affairs. In both examined countries, however, there are some germs of experimental and biological research centres focusing on social and political themes. These nine more or less institutionalised units are briefly characterised in the following subchapter in accordance with their research foci and location.

[85] In October 2018, two young biologists launched their Czech podcast programme in order to popularise the human brain and corresponding phenomena (Brain We are 2020).

[86] Amongst Czech philosophers, it is felicitous to touch on the work of Marek Petrů, since his texts (eg Petrů 2005; 2007; 2009) attempts to be beyond the traditional bounds and hence, he balances on the border of philosophy and biology, and moreover, his texts cover ethical aspects of research as well. Otherwise, as proved in Kuře and Petrů (2015), many scholars are not fully able to cross the frontier of their own disciplines.

2.1 Local research centres

A vast majority of relevant research institutions examining social matters from physiological or neuroscientific perspectives may be found mostly under the patronage and affiliation to corresponding universities in respective Czech towns, ie, *Charles University* in Prague, *Palacky University* in Olomouc,[87] *University of Hradec Králové* in Hradec Králové, and *Masaryk University* in Brno. None of the aforementioned, however, specialise primarily in political affairs. However, some initial attempts to use experimental methods for political research may be seen in the town of Brno thanks to the cooperation between the *International Institute of Political Science (Mezinárodní politologický ústav)* at the Faculty of Social Studies and Faculty of Economics and Administration (Kokta 2014). All the conducted experimental investigations and studies are not under the auspices of any shared institution, nor an administrative body,[88] notwithstanding the resonance of its research in the Czech media (see Kreč 2014).

To one's astonishment when bearing in mind the main research areas, religious studies account for the greatest share in total. Apart from religious studies, economics and decision-making processes account for nearly the rest of analyses together with psychological exploration of cognitive processes, as summarised and alphabetically arranged in Table 1. First, the CEBEX *(Centre of Behavioural Experiments)* works under the patronage of *CEVRO Institute, School of Political Studies* in Prague. In comparison to the others, this organisation is geared towards management and behavioural changes and decision-making. Its fully equipped laboratory is able to examine up to 100 participants per day (CEBEX 2020). Overall, its contribution balances on the border of theoretical work and functional research which may be utilised by businessmen. And

[87] Since 2003, *University Hospital Olomouc* has been running an fMRI laboratory for predominantly clinical research projects (fMRI UPOL 2012).

[88] At the same time, this Department of political science offers its students a specific module *(Experimental Political Science)* to enrol for, and it is associated with Hrbková and Chytilek.

on top of that, the CEBEX aims to popularise the field so that the public may be attached to neuroscience a bit more.

The LEVYNA *(Laboratory for the Experimental Research of Religion)* and the CO-LAB *(Cognitive Laboratory)*, based in the towns of Brno and Olomouc, respectively, investigate aspects of religious from a cognitive and biological view. Primarily, as in case of LEVYNA, research is very much based on deduction proceeding from biology rather than using neuroscience tools. Interestingly, this institution focuses, among others, on religious rituals, morality, and the evolutionary phylogenesis of religion (LEVYNA 2020). The CO-LAB plans to establish and introduce the most advanced technologies, such as the latest model of EEG, Motion Capture System, 3D projection, and the thermal imaging camera, for instance (CO-LAB 2020), so that various facet of religious behaviour may be inquired.[89]

The third group is composed of philosophically or psychologically oriented institutes. The HUME LAB *(Experimental Humanities Lab)* is located in Brno, and its researchers investigate sundry phenomena of social behaviour, eg, solidarity, hierarchy, education, and cooperation. The staff members also come under various departments from the Faculty of Arts, Masaryk University (Bahna 2016, p370). Two fully equipped laboratories of HUME LAB may even be lent to external researchers (HUME LAB 2020). The Prague-based LABELS *(Laboratory of Behavioural and Linguistic Studies),* as formed by the Faculty of Arts, Charles University, cooperates with the *Academy of Sciences of the Czech Republic*. The LABELS functions, similarly, as in case of HUME LAB, as a joint laboratory [of the mentioned faculty and the *Institute of Psychology of the Academy of Sciences of the Czech Republic*] of which main research foci are rooted in perception, attention, and linguistics (LABELS 2020). The penultimate institution of this section is the PLESS *(Prague Laboratory for Experimental Social Sciences)*. As the previous one, even the PLESS was founded at the Faculty of Arts, Charles University, but in this case, it was an outcome of cooperation between

[89] The CO-LAB is yet to be ceremonially opened and thus officially in operation by the end of 2020.

different departments. Moreover, the PLESS systematically collaborates with the CEBEX (PLESS 2020). Last but not least, owing to the character of the founding Department of Philosophy at the Faculty of Arts, the LMS Centre *(Language, Mind, and Society Centre)* dedicates its research to philosophical queries and the mind. The Centre, however, states that its intent is to *"fight further atomisation of sciences"* (LMS Centre 2020).

Alongside, there is the *Society for Cognitive Science and Philosophy (Společnost pro kognitivní vědu a filosofii)*. This organisation was founded by the students at *University of Economics in Prague* enrolled at the courses of cognitive informatics and philosophy. Nowadays, the objective of this society is to unify students of diverse courses in order to share new developments in the field, host lectures and workshops. The Society shares two HQs, in Prague and Brno (Cognitive Science 2020).

Institution	***Town***	***Main research foci***	***Website***
CEBEX	Prague	Decision-making	http://cebex.org/
CO-LAB	Olomouc	Cognitive religion	https://religionistika.upol.cz/laborator/
HUME LAB	Brno	Cognition	https://humelab.cz/
LABELS	Prague	Cognition	http://labels.ff.cuni.cz/
LEVYNA	Brno	Cognitive religion	https://www.levyna.cz/
LMS Centre	Hradec Králové	Philosophy, mind	http://lms.ff.uhk.cz/
PCL	Košice	Cognition	https://pcl.upjs.sk
PLESS	Prague	Cognition	https://pless.cz/
~	Brno	Decision-making	http://experiment.fss.muni.cz/public/

Table 1 Research centres in the Czech Republic and Slovakia

Regarding other possibilities to keep oneself updated amongst the Czech environment, there are events being held across the country. Since 2009, *The Institute of Psychology*, under the *Academy of Sciences of the Czech Republic*, has held 10 educational events in cognitive sciences taking place annually under an apt title *The Cognitive School*. This 3-day programme aims to address sundry aspects of research in cognitive sciences, ranging from methodological techniques, artificial intelligence (AI), and application problems in biology, psychology, and linguistics in order to keep the occasion at a very interdisciplinary level (Kognitivní škola 2019). From 2017, CEBEX has organised its own *CEBEX Summer School* and thereby bringing attention to behavioural aspects of public policy and administration, management, and decision-making (CEBEX 2020b). For the last 20 years (2020), the *Annual Cognition and Artificial Life Conference* has taken place every year. The members of its organisation Board come from different departments of Masaryk University.

Two more specific events shall be highlighted too, since they are meant to inform the non-profession public and other scholars of new discoveries on the human brain: *The Week of the Brain (Týden mozku)* as part of *The Brain Awareness Week (BAW)* has been organised in the Czech Republic since 1998. With a linguistic innuendo, another event is called the *(Strange) In the Head Festival (Festival na hlavu)*. This brand-new event has been organised by the *[Czech] National Institute of Mental Health (Národní ústav duševního zdraví)* since 2018, and its aim is to outline complex issues of (not only) mental health in layman's terms (Týden mozku 2020; Festival na hlavu 2020).

In Slovakia, students might have enrolled at Cognitive Studies, a Master course offered by the *Faculty of Arts at Trnava University*. This philosophy-based course connected the traditional approaches to biology, neuroscience, and the economic game theories (FF Trnava 2020).[90] In Košice then, there is the PCL *(Perception and Cognition Laboratory)* at *Pavol Jozef Šafárik University in Košice*. This institution focuses on cognition with an emphasis on auditory and visual stimuli affecting the cognitive

[90] Until 2019, this course and Department of Philosophy had been academically guaranteed, among others, by A Démuth. Later that year, a high number of scholars from Department of Philosophy had decided to quit amid the disputes with the Faculty authorities over ethical principles and more importantly, the authorities had announced that selected constituents of this course and respective modules are to be permanently suspended from the faculty curriculum (Aktuality.sk 2019).

processes. Moreover, undergraduate, graduate, and postgraduate courses are being offered as well by the Perception and Cognition Laborary (PCL 2020).

However, none of all these institutions could be branded as dominantly oriented towards politics, and on top of that, not only these laboratories specialise in other areas of social science and humanities, but some of them do not employ the tools of neuroscience at all. Some initial endeavours considering political behaviour have been mostly overlapping, inasmuch as the studies treated political variables as a side effect, and thus other objectives represented the leading core of research.

3 GRADUAL EMERGE OF SOCIAL NEUROSCIENCE

Despite its first use as a term in the 1950s, the *"burgeoning field"* (Schilbach et al. 2013) of social neuroscience may be dated to the 1980s and the following decade, when not only the first articles explaining social processes in accordance with the brain activity had been issued, but the field was world-wide popularised thanks to John T Cacioppo and Gary Berntson's contribution (see Cacioppo, Berntson 1992).[91] On the one hand, in that time and not completely differently nowadays, this type of science was based on multilevel analyses and it covered a myriad of spheres of inquiry, ie, social, cognitive, and biological, in order to further improve the capacity of social science research and therefore, finally to overcome partiality (see Matusall et al. 2011; Montuschi 2004). On the other hand, the Nobel Prize laureate E R Kandel recognises the origins of social neuroscience in cognitive neuroscience instead due to its interdisciplinarity when analysing the human brain. And it has been supported by the computational revolution in the late 1980s (Grande-García 2009, p3).

Overall, social neuroscience, as declared in the first issue of *Social Neuroscience Journal*, is meant to *"explore the neurological underpinnings of the processes traditionally examined by, but not limited to, social psychology"* (Decety, Keenan 2006). Hence, it remains evident that psychology, albeit in a problematic manner (cf, Rodrigo 2010; Cacioppo, Berntson 1992)[92] in comparison with other social sciences, had the greatest prerequisite to take part in the neuroscientific research regarding its tradition of analysing how one may understand the others and to oneself as well (Koukolík 2016a).

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[91] In total, there are three main and comprehensive publications on social neuroscience. The eldest one, co-edited by Cacioppo et al., was issued in 2002, while the second one was co-edited by Harmon-Jones and Winkielman (2007). Decety and Cacioppo (2011) were co-editors of the following and already mentioned handbook. All of these books summarised the origins of the field and attempted to show the possibilities of applied research within the area.

[92] Yet the importance of psychology has been overstated because for long this discipline had been considered as part of exclusively social sciences (see de Haan, Gunnar 2009, p3).

Then the aim of neuropolitical research is to pick up the threads of the *"social"* that have led to political consequences, and to examine the *"political"* aspect afterwards, since they are based on social and political cognition (Emery 2005; Adolphs 2006; Knutson et al. 2006)[93] and the concept of social brain (Norman et al. 2012; Dunbar 2014). Even though the first and pioneering projects in social neuroscience had not really employed much of the social in the research itself, recently new studies have been enriched by sociological phenomena, albeit in a still restricted amount (Keysers, McKay 2011, p215; Greenwood 2019).

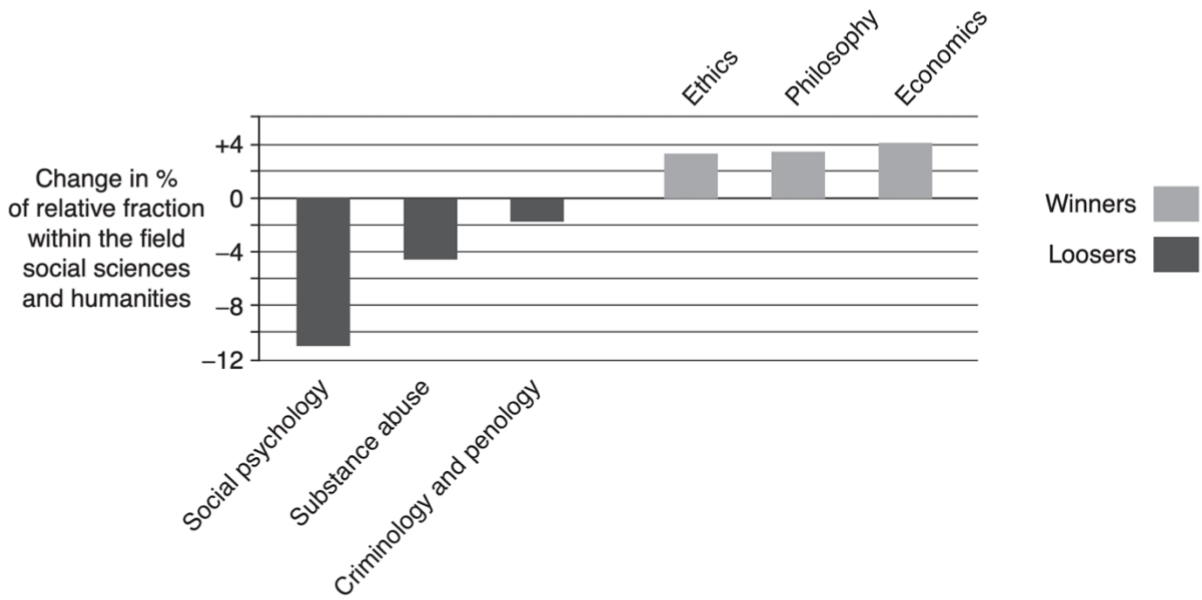

Figure 5 Winners and losers of social neuroscience
Source: Matusall et al. 2011, p19

According to Beadle and Tranel (2011, p50), the features of human nature, which are of the social character, may be subject to modifications and adjustments, while the biological aspects of human body are predominantly invariable, as in case of genetics. Therefore, the potential of social neuroscience lies in two essential spheres (Cacioppo, Berntson, Decety 2010, p8): *i,* new discoveries that pertain to personality traits and human behaviour patterns (eg, Decety, Ickes 2009; Baron-Cohen, Tager-

[93] When taking into account social cognition, it is necessary to realise, as Schilbach et al. (2013) note, that there is a significant difference in observing social cognition separately and when in interaction. For that reason, the authors then proposed a *second person*-based approach.

Flusberg, Lombardo 2013),[94] and *ii,* clinical research aiming to cure sundry diseases (eg, Mendez, Manes 2011; Ibáñez et al. 2016).[95] By contrast, Matusall et al. (2011, p19) examined the *"appreciation"* of various sectors of social neuroscience. In Figure 5, their summarising scheme adverts to the fact the only articles connecting neuroscience to either ethics, philosophy, or economics have arisen an interest in academic debates, while paper dealing with more applied approach failed to attract other scholars to consider it as adequately relevant for the development of this field into sophistication (cf, Rumiati, Humphreys 2015). In addition, many studies neglect the experimental component of research and remain in a vacuum (Fitzgerald, Callard 2015). And besides, Theodoridis and Nelson (2012, p32) mention that conducting an investigation in this area is far more demanding in respect of research methodology, data collection and analyses. In consequence, not addressing many prerequisites adequately and properly usually ends up in great scientific errors.

3.1 Related neuro-x fields and its utilisation in instances

However, it would not be sage to bear in mind only neuropolitics as a sufficient representative. The growth of neuroimaging assisted many other disciplines of humanities to participate in neuroscientific research and hence, one may encounter studies originating not merely in psychology, but also in philosophy, economy, theology and religious studies (see Koukolík 2012). Necessarily, one must realise that it is not solely the technological upheaval which reoriented social scholars to neuroscience, but also the pressure to inquire brand new and deeper roots of human nature. Apart from the aforementioned factors, another intriguing and demanding fact is that it is mandatory to consider the discovery of

[94] Social neuroscience is not being applied in research studies examining solely human beings, but also animals (see Hurley, Chater 2005).

[95] Specifically, some authors may be classified as rather boundary, since their publications address both psychological and more clinical and neurobiological facets (eg, Choudhury, Slaby 2012; Schutt, Seidman, Keshavan 2015; Ibáñez, Sedeño, García 2017).

respective facets of anatomy, such as the mirror neurons and modified methods in examining genetics (Matusall et al., 2011).

Traditionally, politics has been linked to philosophy and economics in the university curricula in the United Kingdom because of its proximity and coupling (see Farmer 2006). For the purpose of comprehensive execution in this thesis, law and its counterpart, neurolaw,[96] will be added because of its tight connexions to politics. In the UK, this overall fascination, as Pykett (2013, p5) notes, has notably led the Government to form a special mission as a new research body, currently known as the *Behavioural Insights Team* of which objective is to interconnect political decision-making and citizenship and political participation options, be it at the local, county or even national level whilst making use of behavioural studies.

Another demonstrable growth of interest in neuro-x fields has been mirrored in the Nobel laureates. Amongst these, two instances are worth noting. In 2000, Eric R Kandel and his colleagues[97] received this award in physiology or medicine for research discoveries that pertain to signal transduction in the neural system. This research draw attention to short and long-term memories (see Kandel 2008). Initially, Kandel co-edited an extraordinary and approximately 1760-page-long book on neural science that has already been issued in five editions (Kandel et al. 2013). Furthermore, Kandel, as an Austro-American neurologist of Jewish origins, further specialises in liaisons between the human brain and the art. Specifically, he examines the way in which individuals perceive various pieces of art in terms of memory (Kandel 2012; Kandel 2016). Secondly, Daniel Kahneman was awarded the 2002 Nobel Memorial Prize for his attempts to merge the theories economics, and primarily the process of decision-making and judgement, with psychology (Nobel Prize 2019; see also Kahneman 1982; Kahneman 2011).

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[96] At the same time, an emphasis may be put on sociology or *neurosociology* and *neuroanthropology*. Nonetheless, these neuro-x fields have not been sufficiently elaborated on (cf, Domínguez Duque et al. 2010; Franks 2010; Franks 2019).
[97] It was A Carlsson and P Greeengard.

3.1.1 Neuroeconomics

Amongst disciplines of social sciences, economics was the first and pioneering one to consider and commence using the neuroscientific findings on (Ölçekciler 2017).[98] In particular, neuroeconomics is said to be officially created amid the formation of the *Society for Neuroeconomics* in 2005 (Reuter, Montag 2016). Historically, the origins and development strategies have appeared in two waves that started by discussing the assets from within of own disciplines, followed by the usability queries (Glimcher et al. 2008, p1). Most interestingly, the first neoclassical theorists who had appraised human behaviour appeared at the beginning of the 20th century, in the 1930s specifically.[99] The findings, nonetheless, they had utilised, were already found *"obsoleto"* by the then psychologists (Babiloni, Meroni, Soranzo 2007, p4). Afterwards, the development and technological precision allowed the field to be in bloom together with the growth of number of papers, as depicted in Figure 6, focusing on decision-making whilst using experiments (see Plott, Smith 2008; Kagel, Roth 2015). These scholars then mostly followed the pattern of experimental psychology (Wilhelms, Reyna 2015). Having said that the vast majority of papers and texts dealing with neuroeconomics predominantly specialised in the process of decision-making and judgement only, the interest is then followed by game theories (eg, Camerer, Loewenstein, Prelec 2004; Nerment, Łatuszyńska 2017; Civai, Hawes 2016; Houdek et al. 2018).[100] Neuroeconomics has been based on *reductionism* as in case of other neuro-x fields, and two cardinal presumption: decision-making may be studied at three levels (ie, psychological, neuroscience, and economic) and secondly, the aforementioned levels are then to be analysed together (Camerer et al. 2015, p156).

[98] A Smith and F A von Hayek may be seen as the founding fathers of economics with Darwinian components in research (Pykett 2013, p14).

[99] According to Glimcher (2003), the dawn of neuroeconomics inheres in the work of Descartes and Pascal, and mathematics as a whole.

[100] However, the first endeavours to make use of neuroeconomics beyond the scheme of decision-making have already emerged after stressing the application eventualities together with the importance of neuroethics (eg Lee 2018; Le Heron et al. 2016; Plitt, Savjani, Eagleman 2015).

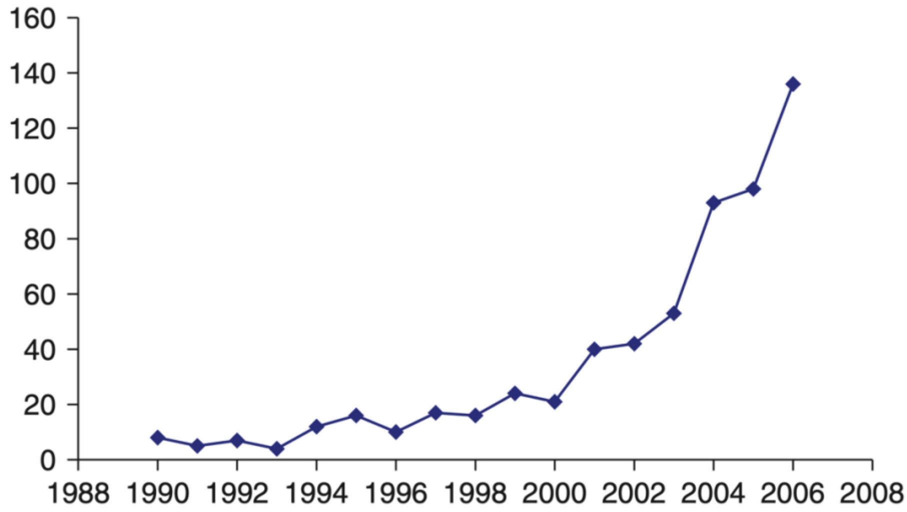

Figure 6 The growth of papers studying decision-making in neuroeconomics
Source: Glimcher et al. 2008, p10

Consequently, Levy and Glimcher (2016) expanded upon the issue of decisions-making when studying the values. The problem they found had resided in the complexity of objectives analysed by economics. In other words, rationality is rooted in deciding how one maximises the profits. There are, however, many situations in which stating whether one option could be significantly better remains difficult,[101] and thus it shall be substantiated by a reward analysis.[102] Overall, as a scientific field, neuroeconomics *"combines"* experiments in order to localise areas of decision-making while using the tools of neuroscience (Kasemsap 2016, p2). Altogether, research studies in this field employ chiefly the most complex instruments, ie, functional magnetic resonance imaging (fMRI) and electroencephalography (EEG), without bearing in mind other possible tools (cf, eg, Burgos-Campero, Vargas-Hernandez 2013; Kable 2011; Kumar, Singh 2015; Alós-Ferrer 2018). Similar to the waves of creation of this field, Glimcher et al. (2008, p7) identified two analogous groups of researchers in the field; those who specialise in neuroscience versus researchers of behavioural economics.

[101] A smart example the authors used states the following: If one is thirsty, which option would be better to accept: A little bit of water or two apples? (see Levy, Glimcher 2016, pp87–88).
[102] In line with the findings of neuroeconomics, rewards play a key role even in clinical conditions. For instance, in case of the youth and their depressions (Mellick, Sharp, Ernst 2015).

Alós-Ferrer (2018) ascribed to a belief that it is not just economic theories making use of neuroscience. Instead, this conjunction could be worthwhile for both of the disciplines. Yet it is crucial to realise from the outset that decent knowledge of many overlapping fields will become indispensable for further utilisation (Kable 2011). The main advantages are rather of a *"rhetoric character"*, but these aspects of neuroeconomics are palpable as Mäki (2010, pp110–111) states in order to scientise economics. The amalgamation of neuroscience of economics was thus inevitable because its data sets should produce new, and not merely interdisciplinary, findings, but also assist in addressing further predictions of human behaviour and decisions, the most traditional concern of economics (cf, Camerer et al. 2015; Levy, Glimcher 2016).[103]

Therefore, Vromen (2010, pp178–179) delineated two routes of further research. Whereas the first one's objective is to postulate new algorithms for predictions, the other one is expected to contribute to theoretical foundations. Only a limited number of papers has considered the obstacles in neuroeconomics and its research conductance though. Hawes (2016, p9), for instance, highlighted the problem of *"overselling the findings"* over the scope of real applied research possibilities, especially when taking into account the fact that human behaviour is based on *i, automatic processes* of which speed exceed consciousness; and *ii, emotions* and its unpredictable power (Babiloni, Meroni, Soranzo 2007, pp5–6). A great deal of contribution to the critical side is associated with Rubinstein (2008, p493), who has concluded that no relevant studies in neuroeconomics have been written so far.[104]

As Pykett (2013, p15) notes, questions and implications regarding economics are always linked to politics and therefore, political science will have been involved even

[103] This traditional understanding of economics does deliver predictions, but respective economists do not study what might actually be the underlying reasons behind each human decision (Levy, Glimcher 2016, p86).
[104] Rubinsten (2008) then conditioned economics by cultural influences, and it therefore denies any scientific contribution. However, this view has already been swept aside (see Mäki 2010).

more in the near future. The influential theory of A Downs also emphasised the importance of ideology in connexion to rationality, a salient element of this concept. According to Downs (1957), voters make use of ideology and vote in accordance with ideology and, at the same time, they do not compare or analyse the policy proposals behind the manifestos. Afterwards, the theorist concludes that ideology is not only relevant as a variable, but it is also rational, since it also functions as a *"cost-saving device"* (Downs 1957, pp97–99). By contrast, Biagini and Peychaux (2014, p7) reconsidered rationality in association with a very own critical text on liberalism, based on a concept of *"gladiatorial ethics (ética gladiatoria)"*. Recently, as they observe through the prism of this theory, people may take delight in life, but their lives still remain burdened with a struggle to survive.[105]

3.1.2 Neurophilosophy

Philosophy has possessed the most intriguing and convoluted relations with neuroscience (Churchland, Sejnowski 2017, p14),[106] notwithstanding the fact that modern neuroscience had originated in ancient philosophy as Churchland (1989) observed at the beginnings of this neuro-x field. Furthermore, it is requisite to take into account that in accordance with the position of adjectives and nouns, two distinct trajectories of neuroscience and philosophy exist. First, *neurophilosophy,* aka *neuroscience of philosophy,* is a new neuro-x field that considers philosophical queries and issues using neuroscience techniques to better understand the traditional processes of thinking and reasoning. And, on the other hand, *philosophy of neuroscience* lingers on the philosophical side; but it questions neuroscience and its employment in

[105] This has led Biagini and Peychaux (2014) to renaming the movement *"neuroliberalism"* in order to put the current situation into context.
[106] Bennett and Hacker (2003, p396) even observed rather an *"unclear relation"* between these two disciplines due to a reciprocal criticism of research methods and foci.

research from the historical and philosophical angle (Bennett, Hacker 2003; Kampourakis 2013).[107]

In respect of inquired topics, a prominent position has been given to the concepts of knowledge, free will, and the understanding of thinking itself, since philosophers have been considering these to be the alpha and omega of the discipline, albeit in a neuroscientific perspective (cf, eg, Churchland 2002; Karlsson 2005; Sinnott-Armstrong 2014; Willmott 2016). In reality of neuroscience though, free will as such does *not* exist; it is only the human brain forming default stories the in the background which may mislead one to those beliefs foregrounding free will as an underpinning of thinking and decision-making (Walter 2001, p625; Fitzgerald quoted in Cashin-Garbutt 2019). Overall, Guala and Hodgson (2010, pp154–155) advocate for a further bloom of neurophilosophy, in spite of the fact that neurophilosophy practitioners will have to stick to the research foci of neuroeconomics, and thus concentrate *a priori* on drawing decisions and game theories.

On the other hand, an eminent role of neurophilosophy lies in the contribution to studies of ethics and morality (eg, Borg et al. 2011; Cushman, Greene 2012; Gangopadhyay, Schilbach 2012; Young, Dungan 2012; Cliquet, Avramov 2018), including its political counterpart of ethics (see Parrish 2007) which mirrors in its partial transformation into neuroethics as a new field (Gazzaniga 2005; Zimmerman, Racine 2012).[108] A second crucial facet of neurophilosophy resides in the mind theories of which importance is expected to keep growing. So that Sullivan (2014, p45) has predicted its rise within a *"decade of the mind"*. Therefore, brand new research studies pondered upon the genesis, functioning, and further clinical application of the mind theories (eg, Mandler 2004; Ermer et al. 2006; Lee et al. 2011; Rosas, Koening 2014). Most importantly, in an fMRI study, Ives-Deliperi, Solms, and Meintjes (2011) not only

[107] This analogy is valid for relations between philosophy and computational models (Rapaport 2017).
[108] Lunstroth (2008, p59) observed three types of neuroethicists: those who originally were either physicians, life and qualitative social scientists, or finally, philosophers.

discerned the brain regions responsible for *"mindfulness"* as a state,[109] but they also delivered evidence endorsing the theory on a possibility to acquire this state on purpose.

Yet Bennett and Hacker (2003) itemised and specified harsh criticism from neuroscience practitioners towards philosophy into four points. First, neuroscientists regard philosophy as a matter of indifference. Secondly, in defiance of some attempts, methods as employed by philosophers have never been really scientific. Then, the shared research interests, such as consciousness and free will, are believed to be resolvable by certain methods and tools of neuroscience only, and not amid philosophical debates and procedures which may be seen as *"utterly misguided"*. Lastly, philosophy has been displaying itself with a certain *"superiority"* in the last 2,000 years, although philosophers have achieved solely *"poor results"* (ibid, pp397–398). Despite the enduring scepticism and research studies being kept separated, neurophilosophy may be justifiable as a relevant field (Mazzocchi 2019, p5). However, it only might need more time to develop (Lunstroth 2008, p61; Smith 2018).

3.1.3 Neurolaw

In the 2000s, neurolaw has appeared as a new discipline for the very first time. Yet the concerns what should be considered right or wrong has been present for centuries (Knabb et al. 2009, p222). An increase in its importance was reciprocally conditioned by a growth of not only modern technologies, but also ethical queries which were even more striking than in case of neuroeconomics and neurophilosophy (Goodenough, Tucker 2010, p63; Aggawal, Ford 2013). Over the years of its short and wave-based history (see Pardo, Patterson 2013), most neuroscience practitioners, who have been joined by pundits of jurisprudence, concentrated predominantly on criminal law

[109] Mindfulness meditations elicited an increased activity in the right posterior cingulate cortex, many other regions, on the other hand, experienced a decline in activity (Ives-Deliperi, Solms, Meintjes 2011).

(Patterson, Pardo 2016, p2). Within this branch, the *"age-long fascination"* has pertained to the use of lie detectors (Pardo, Patterson 2013, p79). The foundations of neurolaw may be found in the endeavours to better understand the offenders' motifs to violate the law. And therefore, it has been based on the search of *abnormalities* in the human behaviour, and the brain in particular, as faddish from the 19th century (Markowitsch 2008, p2). In the world, efforts to use neurolaw appeared especially in the USA as a means of mitigating the punishment proposals in the form of *"neuroscientific imaging evidence"* (NIE), thus employing mostly EEG and fMRI (Jun, Yoo 2018). Overall, however, the number of NIE used is still relatively poor (Pardo, Patterson 2013, p86),[110] and they are frequently disqualified and not count in as permissible evidence, especially due to mixed results in measurement reliability ranging between 50 up to 95% in case of EEG (ibid, p93).

Amongst the crucial findings of neurolaw researchers, it is possible to generalise that the gyrus functions as a dividing area differentiating between healthy and psychopathic individuals, while the grey matter may be utilised as a quantifier (Sato et al. 2011). Furthermore, psychopathological behaviour is associated with thinner cortices in certain areas, as Verdejo-Román et al. (2018) specified in the prefrontal, midline (anterior and posterior cingulate), and the limbic brain regions. Interestingly, the dorsal posterior cingulate cortex (DPCC) correlates with examined ruffians' low prowess to fulfil the tasks inquiring emotional abilities. The left dlPFC then sparks off aggressive reactions (Perach-Barzilay et al. 2013). Emotions have been proved to be a salient trigger together with anger connected to the amygdala and, at the same time, a lower amount of fear or ability to recognise the serious character of committed crimes (cf, Carré et al. 2003; Mariano et al. 2016). Owing to the emotional abilities, Prehn et al. (2013) classified *"hypo-reactive offenders"* as a special category of antisocial individuals, since they exhibit a significantly lower activity in the ACC and PFC when facing

[110] Pardo and Patterson (2013, p86) mention two leading American cases: *Wilson v Corestaff Services* from 2010, and then the 2012 *United States v Semrau*. In both of them, the NIE from fMRI were considered as inadmissible evidence.

decisions on their behaviour. These regions from the mentioned study are then depicted in colour in Figure 7. In addition, Aggarwal and Ford (2013) postulated that further studies would be beneficial rather in connexion to the occurrence of traumatic brain injuries (TBIs) of which importance is yet to be evidenced into detail.

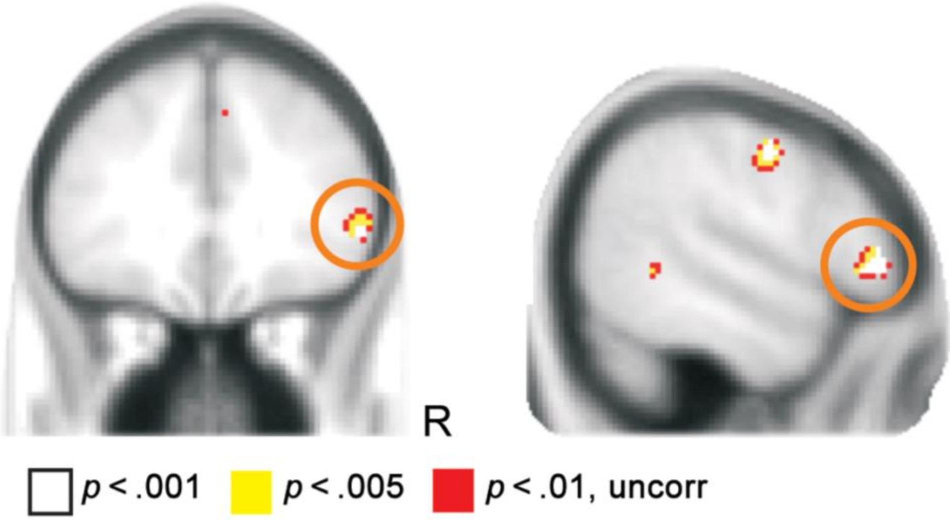

Figure 7 Regions of diminished activity in case of offenders
Source: Prehn et al. 2013, p143

From the philosophical and psychological angle, neurolaw studies, depending on the decision-making process as in neuroeconomics (Pardo, Patterson 2013, p71), examines the aspects of moral deciding, which is linked to the prefrontal cortex (PFC) and its activity (Knabb et al. 2009), and criminal responsibility as a variable difficult to measure (Maoz, Yaffe 2015; Vincent 2010). Finally, there are the morality issues, although Young and Dungan (2012, p7) explicitly concluded that *"moral brain as such does not exist"*. Reversely, some minor studies have dealt with other sides of trials. For instance, the witnesses, conditioned by the activity of ACC and dlPFC, showed an increase in false memory with regard to the intergroup conflict. In other words, it implies that any liaison of inter-group character of witnesses to the defendant brings tendencies to idealise the situation to a mutual benefit (Carpenter, Krendl 2016). Afterwards, those individuals with higher abilities of cognition prefer moderate or more compassionate forms of punishment. By contrast, the opposite group of participants with lower cognition skills favour harsh penalisations (Sargent 2004). In respect of the youths, young offenders and children from worsened living conditions in their surroundings mostly struggle to address emotional tasks and recognise fearful situations, as in case of aforementioned examples with adults (van Zonneveld et al. 2019; Syngelaki et al. 2013).

Patterson and Pardo (2016, p3) identified the contribution of neurolaw to jurisprudence in three areas: *proof, doctrine, and theory*. These three areas refer to the overlapping character of neurolaw, ranging from lie-detectors and delivering evidence, followed by practical application, as in case of *mens rea*, to the theoretical bases of jurisprudence. In the third contribution example, neurolaw endeavours to enrich the concepts of morality, free will or intentions in regard to the *actus reus* and the legal codes alternatively (see also Pardo, Patterson 2013, pp121–139). Notwithstanding the enthusiasm expecting the jurisprudence to benefit from the use of neuroscience (see Markowitsch 2008), and although lie detectors may easily be perceived as the most indispensable means of neurolaw and the most intriguing one too, the fact is that neither fMRI, nor EEG, may currently be able to measure anything like lying (Pardo, Petterson 2013, p85; Aggawal, Ford 2013, p790). Therefore, its precision and development will remain a long-term plan (Prehn et al. 2013). The advantages of neurolaw contrast with a predominance of negative sides. Pardo and Patterson (2013, p97) divided the issues into two broad categories: *empirical versus conceptual problems*. Whereas the former concerns the archetypal obstacles which are known from other natural and social sciences, such as sundry types of biases, occurrences of inaccuracy, manipulations from the examined sample,[111] sampling itself or timing,[112] conceptual problem lies pertain to the legal practices. Thus, one must consider and discern the direct or indirect character of evidence, theoretical foundations, the fact that *lying* does not mean the same as *deception*, and the *mereological*

[111] As observed in a vast majority of research samples, women as offenders are frequently neglected.
[112] In this case, the use of tools of neuroscience may be knotty, since the defendant might have committed the offence a long time before the trial.

fallacy, too.[113] Critical comments of sundry seriousness were summarised by Vincent (2010, p96). She notes that neuroscience and law have not *"unified"* sufficiently yet, and more importantly, judges and barristers or law theorists never engage in one *"generic question"*. And for that reason, the complicatedness of application grows exponentially, and as Knabb et al. (2009, p233) add, new trajectories and eventualities of research in neurolaw will have been set out strictly by neuroethics. Littlefield et al. (2014, p9) accentuate that neurolaw should have been comprehended as *"transdisciplinary"*. It shall point to the fact that there is no need to form other brand-new neuro-x fields and instead, it will be necessary to avoid the *"one dimensional neuro-discourses"* limiting further development possibilities.

3.2 Neuropolitics

Regardless of modern developments and transformations taking place across social sciences and its further precision and data employment, political science still remains oriented towards greater samples of at least approximately 1,000 respondents and it is mostly endorsed by *"ad hoc theories that usually fit poorly to the data, (…) and [it] ignores genetics or biological factors"* (Fowler, Schreiber 2008, p912). The inclination to insist on perfectly representative samples may be seen as groundless in neuropolitics due to the overall character of experimentation and sampling in experiments (see Freestone, McGoldrick 2007). On the one hand, neuropolitics itself is a very narrow sector of science because of its particular theme specialisation.[114] On the other hand, it is more complex than other neuro-x fields

113 Briefly, mereological fallacy, as coined by Bennett and Hacker (2003), emphasises that the human brain cannot be the only unit of the body to think and reason, otherwise it would not be defensible (cf, Schaal 2005).

114 And although psychology is the one of social sciences the others may look up to, sometimes they do otherwise. One simplified instance lies in neuroeconomics and its lack of innovation when being *a priori* stuck with the question of rational decision-making processes without any new ground-breaking perspectives. Neurolaw, on the contrary, could represent a stronger link in understanding the roots of

because neuropolitics has been formed as an amalgamation of the others, ie, as a field grounded in *"multilevel analyses of cognition, brain plasticity and the social brain itself"* (Cantor Hernández et al. 2019; see also Miller, Kinsbourne 2012). Furthermore, neuropolitics remains amongst the last disciplines to join the club of neuro-x fields (Farmer 2006, p653).

After mentioning the difficulties in understanding and assessing *social cognition*, it is cardinal to realise that *political cognition,* functioning as a composite, is even more challenging and exacting (Theodoridis, Nelson 2012, p37). Within this cognition, furthermore, political leanings, be it right of left, further affect cognitive abilities (Bernabel, Oliveira 2017). Neuroimaging has already proved that political cognition should be compared to a *"playground"* (Fowler, Schreiber, 2008) rather than something one may learn as if being at school. Thus, neuropolitics follows the principles of interdisciplinarity emphasising and making use of relations and interconnexions between the human physiology and respective behavioural patterns (see also Bolland 1985; Cataldo 2017). Overall, the objective of this field says that it *"evaluates the subconscious perception and effects created by political parties, politicians and electoral system and decision-making positions on the target group (…) by observing the activity and fluctuations in the brain and the efficiency of interaction between political candidates and target audiences"* (Neuroscience 2020). In other words, neuropolitics endeavours to *"interrogate"* the human brain in order to affirm the expected and, at the same time, discover the unknown in politics (Feenstra, Pallarés-Domínguez 2017, p18).

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criminal behaviour. This sphere of research is limited due to ethics and a lesser amount of experiments though. The infamous 1963 Milgram experiment and 1971 Stanford prison experiment (see Milgram 1974; Zimbardo 2008) may still be lodged in one's mind. And for this reason, the number of academic contributions and papers is still minor. Yet these two examples of neuro-x fields have witnessed more studies and analyses than neuropolitics altogether (Matusall et al. 2011).

Neuropolitics, as one of the truly teenage neuro-x fields, has embarked on attracting attention rigorously two decades ago. In the 1970s, there were initial projects of which the methods and objectives were biological (Schreiber 2011). A distinct isolation between the social- and neuro- scientists has ended up in a dual dispersal of research which was consequentially deepened and geographically intensified. The Atlantic divides two world powers in social and neuropolitical research, the UK and USA (see also Hahn, Jantzen, Symons 2012; Schoonvelde et al. 2019). Even though neuropolitical issues have recently been examined in the Netherlands, Belgium, and Germany too, the Anglo-American milieu has heightened the interest in this field the most influentially. Darren Schreiber, one of the most quoted and respected authors of the field, discerned between the English and American approaches in accordance with the research targets. While individualism, emotions, and personal attitudes are studied in the USA, in England and the Continent, on the other hand, researchers concentrate on empathy, mirror neurons, and the mind (Schreiber 2017).[115] Generally, the most influential studies originated in the USA,[116] and in the near future, European scientists will have to assimilate to the attitude of American progressivism in respect of politics (see van Dyck 2002).

Amongst the science books, three publications have overtopped the others. As the most conspicuous instances, Westen (2009), Lakoff (2009), and a co-edited book of Hatemi and McDermott (2011) tried to expound the biological underpinnings of politics and political behaviour.[117] Whereas the former two mostly point out the issue in connexion to the context of American politics, both the latter and the newest are

[115] Among these mentioned countries, it is possible to identify Turkey as another conspicuous country taking interest in the area. In Turkey, however, social neuroscience and neuropolitics is very much mostly geared towards neuromarketing (Ölçekciler 2017).

[116] The criticised part, however, is how much could this distinction be trustworthy and universally applicable? How liberal are the liberals in the United Kingdom versus in the United States? How conservative one must be in England to fit perfectly to the conservative group in America? Meaning that the political orientation and its perception may differ across the world quite significantly and thereafter, it will be inevitable to examine the matter profoundly (see Koukolík 2012, p59).

[117] Other recent publications on a similar subject were written by Somit and Peterson (2005) or Hibbing, Smith, and Alford (2013).

more rigorous when devoting to strictly physiological and genetic aspects of politics. Interestingly though, none of them used neither the term neuropolitics, nor biopolitics. [118] Instead Lakoff (2009, p198) rather uses political psychology to summarise the group of authors. Even though it cannot be sufficient to delineate and characterise the foci, methods and tools of the field. Furthermore, all of the aforementioned authors stuck in the same research theme, the *"political brain".* Nonetheless, this provocative variable is more problematic in application and interpretation than neuropolitics *per se* due to the abilities of research tools which are yet to be discussed in the thesis. Thus, as the political brain may be appealing, its core and functioning remains unfeasible.

Schreiber (20017) classified three basic themes in neuropolitical research that may be even overlapping: examining political attitudes, neural activity and inner variations, and the social cognition of self-rating as liberal or conservative (cf, Schreiber 2017; Lieberman, Schreiber, Ochsner 2003). However, the most crucial and frequently examined variable inheres in ideological leanings representing the principal theoretical foundation of neuropolitics. [119] The evidence of brain activity dissimilarities between liberals and conservatives has been verified by the 2010s and up to now, research studies keep providing evidence in this area, and thus even a dissimilar character of social cognition differs in case of given groups (Mansell 2020). The concept is supported by a clear logic: Knowing that people tend to two extremes on this scale, understanding how the brain is being then used in political decision-making or when dealing with political motifs may simplify the analysed population into two clear bunches of samples scientists and marketers can elaborate on. This fundamental distinction between liberals and conservatives symbolises the most prominent issue stressing not only political ideology but exposing one of the most visible and applicable aspects of neuropolitics (Jost, Amodio 2012). Having a profound

[118] In Hatemi and McDermott (2011, pp273–299), it was only Schreiber who employed the term in his chapter.
[119] *Chapter 6* elucidates the theoretical background and its application in detail.

understanding of the delineation between these two groups of people may guide a political campaign to winning an election, approval ratings (Gutierrez-Rubí 2009) or even fighting terrorism (see Koljević 2015; Decety, Pape, Workman 2018).[120] Yet in many instances, this connexion of politics and neuroscience is being perceived as mysterious or even eerie due to the proximity to political indoctrination and mind-reading (see also Nicholson, Stich 2003) as if this might consequently violate G Orwell's notable quote from his book that *"nothing was your own except the few cubic centimetres inside your skull* (Orwell 2014, p14).[121]

Neuropolitical studies are in line with two elemental approaches.[122] First, papers and its conclusions are deduced from other papers and its findings which are re-discussed and therefore, the outcome is drawn predominantly on someone else's contributions (eg, Hibbing, Smith, Alford 2014a). Apart from the expenditure reduction, one tiny little blunder may cause significant misunderstandings for many years. Second, scholars may, by contrast, deliver their own data sets (eg, Amodio et al. 2007). The second approach may be demanding twice more than the first one. If overcoming respective obstacles,[123] the second approach would bring forward new topics with a notably high value and a long-term impact.

In fact, even Aristotle's claim (2003), foregrounding that *"ethical and political decisions are permanent"*, flawlessly favours the substance of political science, and it may even indirectly prod scholars into further expanding upon neuropolitical research.[124]

[120] Though the findings of neuroscience are valuable not only for scientists or political campaigners (Nasrallah 2018). Gutierrez-Rubí (2009) emphasises that politicians should also employ the acquired information in order to promote democratic values. At the same time, biology-oriented research shall also advert to things which are yet to be done, be it at the level of citizens or politicians, and this facet preserves the side of normativity (Lemke 2011, p123)

[121] The quote comes from Orwell's *1984*, a book issued in 1949 in response to political upheavals and regime changes across the world in that time.

[122] Neuropolitical practitioners concentrate their attention to either particular brain areas with an intention to observe a certain activity for specific political behaviour, or the brain is examined as a whole in hope that any neural activity appears.

[123] The difficulties that pertain to neuropolitical research are discussed in *Chapter 9.1* on the limits of neuro-x fields.

[124] Sooner or later, taking other biological aspects into account, such as genetics for instance, will be unavoidable as science has adopted the contemporary *"neuroculture"* of research (Ölçekciler 2017).

3.3 Applications of neuropolitical research

Lavine (2010) discerns and outlines four general trajectories of research from the past up to nowadays. Beginning by the 1940s–1950s analyses on personality traits up to the late 1980s and its voting behaviour era, he foregrounded the late 1990s because since that time, emotions have been viewed as a significant variable for political scientists. Finally, in the 2000s, studies in political research entered the neurocentric age when pondering upon the role of evolution, genetics, and neurophysiology in political behaviour. According to this classification and in line with the observed contemporary research, neuropolitical research may be divided into solely political-oriented studies versus ancillary elements which, however, possess a significant connexion to politics. Even though the topics of these two groups are frequently overlapping, the following Table 2 boils down and divide the studies into respective categories on the basis of its research foci. Some preliminary classifications, this table is based on, follow the initial motions to employ neuroscience in political research that had been made by political scientists in 2006.[125]

ANCILLARY ELEMENTS	Emotions and empathy Prejudice and sundry forms of biases Race and religion Humanities Ethics and morals Banality of Evil and violence
POLITICAL ELEMENTS	Socio-economic factors Political neuromarketing Public policy International relations Ideological leanings

Table 2 Directions of neuropolitical research

Genetics has already been verified as a relevant variable influencing political participation in first pioneering studies (see Fowler, Dawes 2008; Weinschenk et al. 2019).

[125] Before the 2006 *Conference of American Political Science Association* (APSA), a pioneering course had been held in order to clarify the impact of neuroscience on politics. From this event, Farmer (2010, p121) infers that *"(…) what counts as common sense political science talk is problematised by neuroscientific results"*.

Apart from political campaigning and its reciprocal coupling to *"political emotions"* (cf, Brader 2005; Valentino et al. 2011; Slanevskaya 2012; Weber 2012; Huddy, Mason, Aarøe 2015), the corollary and power of emotions have been extensively analysed in many academic handbooks (eg, Verhaeghen, Hertzog 2014; Barrett et al. 2016). Yet some salient discoveries are still rather new, such as the plasticity of social emotions and its formability being influenced by training (see Klimecki 2015). Marcus (2012a, pp49–50; p77), while discussing emotions in politics endorsed the dicta of D Hume who had interconnected and conditioned reasoning by *passion*, meaning emotions as perceived in modern psychology. Contemporary neuroimaging techniques have also assisted in uncovering some concealed aspects of emotions (Ochsner, Gross 2008). The fact is, however, that theorists of political science, and international relations in particular, do not pay attention to the new findings from physiology, nor they employ it in their research studies (Bleiker, Hutchison 2014). Therefore, only a limited number of papers have expanded upon it (see Mills et al. 2016). In their SCL study, Cecchetto et al. (2017) demonstrated, that a higher level of empathy then correlates with the rise of stress, observed via skin conductance, while taking more eventualities into account (see also Fabi, Leuthold 2016; Mason, Bartal 2010). Empathy, as the *"ability to share emotional experiences"* (Beeney et al. 2011) is also recognised as the indicator in two other variables crucial for politics: prejudice, be it in a form of racism or not, and social rejection (Segal et al. 2011).[126]

* * *

Lippmann had initially used the term *"stereotype"* which has later been worked up into the forms of bias (Quadflieg, Macrae 2011, p216). Stereotypes and biases are accompanied by a by-product of *social exclusion* intensifying and extending the role hereof (see Kiat, Straley, Cheadle 2016). Favouritism, by contrast, is associated and

[126] In this regard, it is necessary to add that the ensuing social pain differs distinctively from physical types of pain (see Lieberman, Eisenberger 2008).

examined amid *"intergroup"* or *"ingroup"* relations (cf, Moradi et al. 2020),[127] a concept that has become considered as a salient variable in the field of international relations too, as it will be demonstrated below. Even the processes of facial recognition are dependent on uncertainty[128] leading to attention biases or threat perceptions (Morriss, McSorley, van Reekum 2017). A certain problem is, however, that there are two types of processes. While the former pertains to fundamental *"low-order"* processes, the advanced one studies more abstract and complex aspects, such as biases (Quadflieg, Macrae 2011, p254). When discussing biased attitudes, the most often repeated applied variable is race, followed by religion. Although racial biases, which also pertain to the own race (Hahn et al. 2012; Prete, Tommasi 2018), may be studied with neuroimaging techniques, it is necessary to realise that *"every experience leads to an alternation in the brain"* as Phelps and Thomas (2003, p754) brilliantly remark. Therefore, longitudinal studies will always produce diverse outcomes due to the learning processes.[129] Overall, psychological and neuroscientific studies tend to focus mostly on the aberrant side, meaning the biased attitudes of examined participants. Only a restricted number of studies have considered a reversed eventuality, ie, to inquire the brain reactions after having experienced racially biased behaviour (eg, Masten, Telzer, Eisenberger 2011).

Yet the amygdala may be perceived as an indispensable trigger for the ensuing emotional reaction (Phelp, Tomas 2003), Schreiber and Iacoboni (2012) disclaimed this theory in their fMRI study after linking this phenomenon to stereotyping, not the race itself as an initiator. Recently, Engelhardt (2020, pp11–12) used the American instances from the 1990s to 2000s to introduce an inverse hypothesis. According to his findings,

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[127] Ke et al. (2019) foreground that it is not only the perception of the others in or outside the group, but also the positive versus negative self-evaluation which is mirrored in the respective neural activity (cf, Norris 2019).

[128] Morriss, McSorley, van Reekum (2017, p3) specify that it is the *"intolerance of uncertainty"*.

[129] In a rare study on CEE, researchers (Willard, Cingl, Norenzayan 2019, p9) stress the cultural differences between Czechia and Slovakia in respect of religiosity whilst concluding that the cultural background affects the cognitive abilities regarding the religious matters. The use of religious arguments in politics is then conditioned by the territory, its local history, and the type of creed (see also Weiberg-Salzmann, Willems 2020)

it is not the social milieu,[130] but partisanship instead, which, especially in case of Caucasian individuals, possesses a critical solution to racial politics. In Belgium, Onraet et al. (2017, p29) remarked in their n=419 study that *"subtle"* racial prejudice was related to conservative attitudes and these two indicators, by contrast, exhibited a lower level of emotional intelligence.

* * *

As in case of favouritism in race, Huang and Han (2014) affirmed that the ingroup preference and respective empathy function identically for religious and non-religious discernments. Except for the thalamus, Mohandas (2008) emphasises that neural structures of manifold characters and the PFC, in particular, serve as generators of brain activity in respect of religiosity. The ventromedial PFC (vmPFC) is widely acknowledged to play an active role in religious beliefs (see Ferguson et al. 2016).[131] Zhong et al. (2017), however, focused on the connexion between religious fundamentalism and the vmPFC, and they found that it was also the dlPFC lesions taking part in constituting fundamentalist attitudes. This finding was consequently mirrored in a lower level of examined participants' ability of *cognitive flexibility* and *openness*. Mudge, Fleming and Lovat (2015, p150) observed that religiosity and religious education could become a peculiar research field in the near future.[132] Not

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[130] On the contrary, Lang and Kundt (2020) argue that comprehensive analyses of the societal history and evolution are necessary in order to comprehend the biological and physiological underpinnings of human behaviour and religion specifically.

[131] Holbrook et al. (2015) concretised research in the area with a revelation that the posterior medial frontal cortex (pMFC) controlled adherence in both ideological and religious beliefs. Subsequently, the difference between various creeds versus non-religiosity was reflected in the brain activity too. While the vMPFC prevailed among atheists, Christians, by contrast, exhibited an increased brain activity in the dorsal mPFC, as it was documented in an MRI study (Han et al. 2008).

[132] In respect of education as a discipline, one must consider the fact that education has adopted neuroscientific procedures in the form of *neuroeducation* or *neuropedagogy or educational neuroscience*, respectively (Frith 2005). The initial studies and conferences dealing with the field took place mostly in the USA which, as in case of other fields, may be partly restricting due to dissimilar forms of education system (Geake 2004, p95). The purport of this neuro-x field is to better understand the brain, its attention, learning and memory processes so that the brain can be taught something new fruitfully (Maršák, Janoušková 2014), and moreover, the teaching methods can be optimised for the instances of disorders or specifically for given periods of development in the human life (eg, Twardosz 2012; Bravo 2014). As Lee (2003) critically notes, however, the applicability rate of neuroeducation is rather poor, since neuroscience itself remains immature in findings and generalisation perspectives.

because of religious doctrines and its content but because of its effect associated with, among others, a distinctive brain activity. Progressively, this neuro-x field has been on the upgrade most prominently (eg, Seybold 2007; McNamara 2009; Voland, Schiefenhövel 2009).

* * *

Humanities may, *sensu lato*, be comprised of many other subdisciplines but in this context, it specifically means the influence of cultural particularities *vis-à-vis* society. Cultural aspects,[133] as Kitayama and Tompson (2010, p94) summarise from other studies, form an *"external environment"* whilst having various *"behavioural routines"* imposed. Having observed that, they compiled an interaction model which did consider the role of culture in behavioural patterns. At the same time, these cultural, behavioural and genetic patterns are subsequently reflexed in the human brain activity (Chiao et al. 2013, p2). Figure 8 illustrates the coalescence of cultural and biological variables in one scheme. Similarly, one must bear in mind that there are salient differences in perception itself in case of people originally from the West and Asia (Ames, Fiske 2010, p72), which makes possible generalisations more intriguing and yet complex as it was also demonstrated and vindicated in a comparing study between Japanese and Western participants (Russel et al. 2018). Furthermore, a great variety of cultural responses have an impact on intergroup as well as intercultural relations, and thus may be further applied to studies in international relations (see Na, Chan 2015; Doole et al. 2015).[134]

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[133] Cultural aspects and propensities are mostly represented by *ethnography* and recently also *cultural psychology* which are united by a holistic approach, whereas neuroscience is based on reductionism (Ames, Fiske 2010). However, Sarto-Jackson, Larson, and Callebaut (2017, p12) exalt anthropology too when using the neuro-x field terminology, *neuroanthropology,* which they see as a means of neuroculture clarifying the role of human behaviour (see also Choudhury 2010). Reversely, Ortega and Vidal (2016, pp967–969) contrast neuroanthropology with neuroculture after observing that these two new disciplines differ in research objectives. While neuroculture merely seeks *"brain-level explanations"*, neuroanthropology, as a superordinate field, interconnects the findings of the former and expands upon then.

[134] Mondloch (2016, p27) aptly praises the contribution of Choudhury and Slaby whose project (*Critical Neuroscience Group*) gathered researchers so that physiological and psychological processes that pertain to sundry areas of humanities are recognised and scientifically addressed.

Figure 8 Neuroculture interaction model
Source: Kitayama, Tompson 2010, p94

Miller and Kinsbourne (2012, p36) itemise the added value of research studies on both sides, ie, neuroscience and culture, if cooperative projects were employed more frequently. They point out expectable dissimilarities amongst cultures, but on top of that, according to the authors, further research studies could be able to assist in elucidating the development of brain activity in regard to cultural matters and cognition (see also Saligman Choudhury, Kirmayer 2016).[135] Importantly, owing to neuroscience, art and culture theorists have been forced to rethink their traditional research methods as it had been employed in the past 50 years. And so, scholars have gradually started employing more rigorous methods and using neuroscientific findings on when inquiring art and culture, and *vice versa*, meaning that neuroscience practitioners do consider the cultural aspect in the brain activity and its shifts (Mondloch 2016, p26).

* * *

Two final and, in part contradictory, directions of research engage in either questions of morality and ethics, or attributes that pertain to the banality of Evil, as the

[135] Regarding to cultural aspects, Rule, Freeman, and Ambady (2013, p7) suggest that *social class systems* slightly vary across the world, and its further acknowledgement in research might bring outstanding findings. Similarly, they endorse the fusion of cultural neuroscience and genetics as two powerful areas of research.

collocation was coined by H Arendt. Whilst the former is to be analysed as a separate chapter, it is still appropriate to see the possibility of contribution to research. Zocchi and Pollack (2013, p58) identified five trajectories for studies to follow, ranging from social issues and its examination, philosophical queries, and neuromanipulation[136] to predictions (see Kelly et al. 2018), and general and comprehensive studies which lead to meta-analyses. All of them overlap and as consequently demonstrated, ethics in its further form of neuroethics represents a prominent agent of neuroscientific research. Secondly, manifold criminal offences may be directly or indirectly associated with politics. And moreover, offences may vary in character from social norms violations (eg, Harris, Fiske 2010) and aggressive behaviour to committing sundry atrocities, such as genocides. All these forms of criminal behaviour have come under scientific scrutiny (cf, eg, Ackerman, Jahoda 1950; Harris 2009; Huggins, Haritos-Fatouros, Zimbardo 2002; Neroni 2015).[137]

Aggression, a pivotal concept in the field, is traditionally associated with lower volumes of the amygdala or even its volatile activity in case of pathological aggressors (Rosell, Siever 2015, pp260–261). Regarding the brain regions, in an fMRI study of Decety et al. (2014), it was verified that pathological aggressors exhibited a lower and yet concordant activation in the vmPFC and orbitofrontal cortex (OFC), whilst initially processing various faces in the photographs.[138] By contrast, psychopathological individuals also experienced higher levels of *sorrow* and *dismay* due to their increased activity in the dorsal insula. Aggressive behaviour, expressing itself in a lower amount of neural processing resources in case of violent individuals (Fanning, Berman, Long 2014), has also been analysed from a perspective of corresponding brutal video games

[136] Neuromanipulation stands for a goal-directed employment of neuroscience for the purpose of data misuse or in order to manipulate the participants and change their behavioural patterns or temporarily modify them to the liking of the contracting entity.

[137] Pioneering studies ponder upon the state of victims when demonstrating the long-term impact of, for instance, *humiliation* which cannot be overcome easily and may pertain to dictators too. The same applies to the effect of approval of the *third-party punishment* (see Otten, Jonas 2014; Bellucci et al. 2016; Zimbardo 2008; Zinchenko 2019).

[138] Peng et al. (2015) added that these two areas were also linked to morality and gossip processing too, be it rumours about oneself, friends, or celebrities.

and its players. According to the computational model-based study of Lamb et al. (2017) examining an extensive sample of n=1065, there are cultural and genetic predispositions which accelerate aggression. Scientifically, however, there was an evident shift suggested from the early 1990s, when researched had concentrated on cognition and attention. And not even in a decade later, and due to the technological development, it was emotions and physiology being at the centre of attention when stressing the deviant cases and disfunction in emotional processing (Blair, Lee 2013, p108).

3.3.1 Political elements of analysis

Except for traditional sociological variables, such as the age, gender or the territorial origin of examined samples (see Franks 2019, pp101–105), neuropolitical research has either *i,* engaged in other aspects of society, as for instance, prejudice, violence, social brain or inequality when focusing on the topics in respect of societal and physiological conditions (eg, Carroll 2009; Davis 2013, Mason, Bartal 2010; Nelson 2013), or *ii,* expanded upon more profound situations linked to social needs, communication, relationships and cognition itself (eg, Hamilton 2015; Okruszek et al. 2016; Tomova, Tye, Saxe 2019). Social behaviour, enriched by mutual relationships in sundry forms, originates in the PFC, specifically the ACC and orbitofrontal cortex (OFC), which are adjusted and *"regulated"* by the serotonergic system (Gerretsen et al. 2010, p379).

Interestingly, music genres have become viewed as another felicitous variable elucidating human behaviour and personality traits in accordance with the music processing whilst having the inferior frontal gyrus activated (Cheung et al. 2018). Devenport and North (2019) divided music genres into four group and unfortunately, liberals represented the only political pole of their analysis. This research, nonetheless, only supported their hypothesis claiming that liberals were associated with volatile and *instable* taste in music (ibid, p12). Albeit in line with general neuroscientific findings on liberals (cf, eg, Critcher et al. 2009), conservatism or centrism had been completely omitted. Overall, according to this study, political orientation would be verifiable only if the music preference were accompanied by psychological personality traits. When stressing these traits and political leanings, it became palpable that, in strictly political elements,[139] ideology has been the most prevailing variable.[140]

* * *

The first use of neuromarketing as a term is associated with A Smidts and the subsequent introductory conference on neuromarketing held in the USA in 2004 (Kumar, Singh 2015).[141] And since that time with approximately 90 private companies engaging in neuromarketing in the world (Zurawicki 2010, p211), it was just a *"matter of time"* for political parties to spot this as a new opportunity (Jarrett 2015). The tools of neuroscience, together with a specific research *(neuro-)*design (see also Bridger 2017), are expected to assist in overcoming the three fundamental types of regular biases causing inaccuracies as identified by Badoc and Bayle-Tourtoulou (2016, p27),[142] who foregrounded the *lack of conformities*, *liberalisation, and the contextual matters*. While the first one stresses the presence of interviewers, followed by participants' problems to express themselves, and the last one adheres to sensitive issues respondents might not be willing to talk about. In addition, neuromarketing is worthwhile, not only because its expectable dedication to customers and business profits, but it can also be employed in clinical conditions in order to examine, for example, pathophysiology, dementia, compulsivity, and last but not least, it shall keep debates on neuroethics stimulated (Javor et al. 2013, p8). Yet the salient domain of neuromarketing lies in the

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[139] However, there are also politically more or less active movements, eg, feminism, which have commenced preliminary neuroscientific projects within neuro-x fields as *neurofeminism* (see Schmitz, Höppner 2014).

[140] Since ideological underpinnings are to be applied in this thesis, this constituent of neuropolitics will be analysed in the theoretical section, ie, *Chapter 6*.

[141] The first academic books on neuromarketing were concurrently issued in German and French though (cf, Scheier, Held 2006; Häusel 2007; Raab, Gernsheimer, Schindler 2009; Roullet, Droulers 2010).

[142] Over 80% of newly created campaigns, commercials, and advertisements have failed to deliver a product people would be able to memorise and identify (Lindstrom 2008; Badoc, Bayle-Tourtoulou 2016). And paradoxically, television, as the most expensive means for the contracting entity, represents the greatest challenge, albeit in decline (see also Vecchiato, Cherubino, Trettel, Babiloni 2013).

business scheme and especially in the brain activity that pertains to branding, a significant process linked, for instance, to consumers' attention, memory, loyalty and likeability (see Plassmann, Ramsøy, Milosavljevic 2012). Therefore, this delineated multi-interconnectedness mirrors in respective functionalities of given brain areas, that are depicted as Figure 9.

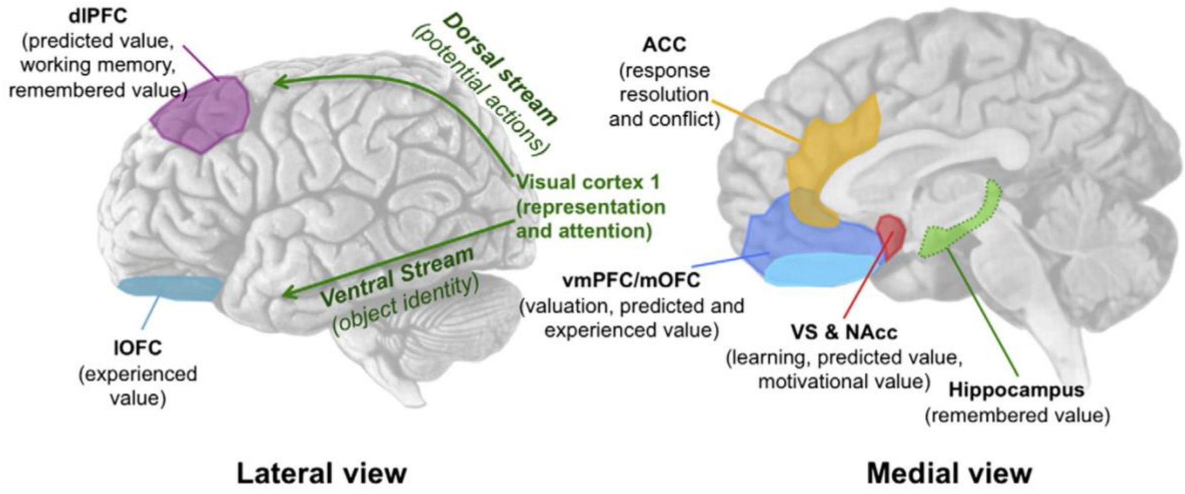

Figure 9 Brain areas associated with branding
Source: Plassmann, Ramsøy, Milosavljevic 2012, p20

Conventional political marketing specialising in the processes of decision-making and political leverage, when voters are treated as customers and political candidates and their parties as products, have already been linked to the theories of evolution (see Saad 2003). Recently,[143] new instances of application have emerged in the UK too. For example, the infamous political marketer and adviser, Dominic Cummings, is well-known for his interest and frequent involvement with computational models and psychology in electoral campaigns, most famously before the Brexit referendum in 2016 (Parker 2020).[144]

[143] In the light of recent events, there are also popular books drawing attention to the brain and the best methods *(sic)* to utilise it sufficiently (eg, Howard 2014; Morin, Renvoise 2018).
[144] However, when the practices of political psychology and neuromarketing are applied, the overall scale of political and ethical implications one must consider greatens (see Levy 2009).

Latterly, political neuromarketing has been forming on the assumption that consumer psychology, economics, and business strategies had already become a convenient instrument for any product promotion (see Lindstrom 2008; Pradeep 2010), especially after having analysed respondents' conscious and unconscious responses to campaigns (Daugherty, Hoffman 2017, p5). [145] Gradually, political marketing companies and practitioners have emerged and worked in many countries across the world, albeit in a narrow number (Brinkerhoff, Straehley 2015; Mills 2015).[146] Political neuromarketing, as Lane (2015) observes, still endeavours to break out of the vicious circle of its former *"stigmatised"* perception. And alas, no truly exhaustive academic papers, nor books, have been delivered in respect of the application possibilities of political neuromarketing as a separate branch of marketing (cf, Cwalina et al. 2011).[147]

Eventually, Ariely and Berns (2010) expanded upon the utilisation possibility of neuromarketing. According to their paper, the traditional approach, based on the *"grooming"* process (ibid, p290), when candidates are readied and smartened up, may be improved or even substituted by political neuromarketing. Afterwards, it shall be feasible to *"design a candidate"* so that even the moment conditioned by the first impressions becomes a thriving moment (see also Bridger 2017, pp81–101). There are new discoveries in respect of two crucial areas. Firstly, it is the *visual appearance*, and secondly, there are *opportune patterns in human behaviour* campaigners could make use of. Regarding the visual side, there are brain-based studies examining facial recognition and its concurrent emotional processing (van de Riet et al. 2009; Manssuer et al. 2015), gazing attention (Lassalle, Itier 2013), first impressions (Bridger 2017; Fuchs

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[145] Daugherty and Hoffman (2017, p13) summarised research studies in neuromarketing. In their classification, or rather *taxonomy,* they discerned six categories ranging from *attention, brand preferences, brand renewal, brand assessment, and memory, to costumers' purchasing behaviour*.
[146] Political neuromarketing practices have already been used, for instance, in Argentina, Mexico, Spain, Poland, Costa Rica, Brazil, Poland, Turkey, and in the USA in case of H Clinton's presidential campaign (Brinkerhoff, Straehley 2015; see also Lane 2015; Halpern 2020).
[147] A minor exception may be found in a couple of theses (eg, Veneziano 2011; Carvalho da Fonseca 2017).

et al. 2017),[148] attractiveness (Gakhal, Senior 2008; Boz, Yilmaz 2017; Kedia et al. 2017), and even so-called *"political smiles"* (Stewart, Bucy, Mehu 2015) of which use is weighty especially in the USA. *A contrario*, Smith, Kornelsen and McIver's (2017, p3) n=13 study analyses the process of repulsion and its expression. This fMRI experiment proves that expressing loathing is also associated with a significant growth of the thoracic spinal cord and, at the same time, increased breathing in and out. In a juxtaposition, there are other apt types of findings marketers might draw upon. Starting from the fact that different types of lies are conditioned to a different brain processing (Morgan, LeSage, Kosslyn 2009) in terms of the cortical regions of interest (ROIs). And moreover, when one tells a lie about oneself, the brain ROIs are activated divergently in comparison to lying about someone else (Ganis, Morris, Kosslyn 2009). There are also techniques and models exemplifying manifold shapes of persuasion to deception (Cacioppo, Cacioppo, Petty 2017; see also Ganis, Keenan 2009). Yet the number of studies and papers remains exiguous or besides, its findings are questionable (see Krastev et al. 2016).

Notwithstanding the modern and advanced research methods, the first neuromarketing studies had been patched together without using rigorous and *"robust scientific methods"* (Coutinho 2018, p7), and neuromarketing has been in for it. In the near future, this *"opaque system"* imposed in private companies (Stanton, Sinnott-Armstrong, Huettel (2016, p799),[149] which dominate the political neuromarketing milieu, is expected to cause difficulties in terms of ethics. Zurawicki (2010, p211) also illustrated another inner problem that resides in the fact that a minute of fright produced by a campaign, and activating the amygdala, does not elucidate, nor imply, a continuity of sense of dread for a *"genuine"* and longer period because forthwith, the

[148] In accordance with the age of examined participant, emotional reactions vary and so does the neural processing (see Hoehl, Striano 2010).
[149] There used to be *"unstable"* relations between the private neuromarketing companies and academia, but these were normalised by 2007 (Levallois, Smidts, Wouters 2019, p15).

human brain processes other types of information and hereafter, it affects further behavioural patterns.[150]

* * *

Public policy and administration had been initially merged with biological and physiological traits in the 1980s when White and Losco's (1986) edited book *Biology and bureaucracy* was issued.[151] Nowadays, two elemental directions of this neuro-x field research may be identified. In accordance with its predominant foci, one may observe *i,* studies on human evolution and bureaucracy as a whole, and *ii,* studies on human evolution in connexion to decision-making as a process of bureaucracy (Larimer, Peterson 2019, p113). In order to specify the field, Farmer (2006, p654) then coined the term *"neuro-gov"* when discerning the liaison between neuroscience and public administration and governance.[152]

When Gruenfeld (2016, p16) focused on the *American Supreme Court* and its justices in both liberal and conservative periods, she observed that once again ideology as an independent variable was always complemented and *"confounded with policy makers' status in the decision-making groups to which they belonged".* By analogy, Arceneaux (2020) foregrounds the other side of debate, ie, the general public. According to that paper, research studies should focus on individuals as members of the public, and more specifically, their stances that pertain to public policy and democratic rule, since this facet still keeps the system alive. Nevertheless, the fact is that the most noticeable amity inheres in health policy with neuroscience (see Hall 2013; Brandon, Mohr 2019) because it allows policy makers and other stakeholders to communicate with the public efficiently, be it at the national or supranational level as in case of the European Union (see Flear 2015).

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[150] At the same time, experiments under laboratory conditions cannot really substitute reality, and thus this sensation of fear, as it was illustrated, is not necessarily candid (Zurawicki 2010, p211).

[151] An interesting contribution to biopolitics represents Kerr's (2018) monograph of which aim was to adumbrate the use of biopower of hospitals, as crucial institutions, from a historical perspective of Victorian London.

[152] It is also feasible to dismantle sections of policy into minor pieces as if literally having genotypes and phenotypes and afterwards, a better policy functioning may be achieved (see Mosier 2019).

Cooperation lingers being rather problematic because politicians and officials together with scientists do not pursue the same objectives. Furthermore, it is too time-consuming, and the final results may be insecure, especially in the topics which are scientifically and politically dividing, such as in the global climate change (cf, King 2016; Hunter 2017). Yet public policy and administration will have to utilise neuroscience because the public is keen on ground-breaking findings (cf, Wardlaw et al. 2011) and, at the same time, findings may endorse proposed policy steps. However, the liaison may function properly, provided that the general public will have received all the neuroscientific findings and information with *"simple frugality"* because otherwise, it will be unconvincing to address other more complex issues, such as racial or religious behaviour patterns (Kang, Inzlicht, Derks 2010, p596).

* * *

Research in international relations, or *neuro-international relations* as Holmes (2014) labels it, lags behind as the most belated in comparison to other neuro-x fields and even neuropolitics.[153] There are currently two most relevant publications in this interdisciplinary area of which content is rather safe and general in character and thereby corresponding to handbooks.[154] Whilst the former (see Yetiv, James 2017) considers other disciplines able to contribute to theories of international relations, the latter (Clément, Sangar 2018) delivers a set of case studies combining various approaches to the study of emotions. The most customary variable employed for analyses in international relations is based on *intergroup relations* and its examination (see Terbeck 2016, pp37–46).

A couple of studies have, however, pondered upon various deterrents appearing in international relations, especially in connexion to war and conflicts. The first experiments have already endeavoured to influence and change functional

[153] Yet some studies have tried to consider the biological element in examining peace building or colonialism. Most frequently, however, researchers link the theory to M Foucault and his work (eg, O'Kane, Hepner 2009; Kiersey, Stokes 2011; Mezzadra, Reid, Samaddar, 2013).

[154] A short time ago, Holmes (2018) called attention to diplomacy in its *tête-à-tête* form. His research vindicated that, even from a historical perspective, it has been a more successful approach.

settings causing violent and aggressive behaviour. Notwithstanding the mixed results and the lack of sociological background, researchers affirmed the eventuality to at least partly modify and affect one's information processing (see Influs 2018; Valencia 2020).[155] In conflict studies, a key position is always represented by the capability of reconciliation and threats. An obstacle to peace solutions determines that whilst threats, associated with an increase activity of the amygdala, are *"automatic"*, reconciliation is conditioned by a more profound and intensive cognitive activity (Lantos et al. 2020, p5).[156]

The ultimate stage of conflict escalations usually results in a state of war, and as Krishnan (2014, p2) notes, neuroscience is going to change the way of warring inevitably and beyond recognition, since the human mind shall become *"the sixth domain of warfare"*. Krishnan then delivers rather mixed inferences. On the one hand, the use of neuroscience tools may help *(sic)* redirect the military leader and direct away from mass killing intentions. But on the other hand, the use of *"neuroweapons"* may create an unprecedented zone of atrocities (ibid, p17; 19). In this respect, McSorley (2020, p13) foregrounds the often-neglected olfactory sense of which importance lies in its use. It becomes indispensable for soldiers in their attempts to localise the enemies within the territory as well as it triggers their decision-making processes.[157] In the aftermath of the Great War and its experience together with 9/11, the use of biological weapons, alongside the knowledge of human mind, has been arising recently (cf, Beck 2003; Kováč 2003). And this type of information has become necessary even for terrorists. Researchers (Decety, Pape, Workman 2018, p36) confirmed that extremist attitudes which are in possession of terrorists are universal, and thus applicable to every individual without any reason to be classified as terrorists or psychopaths.

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[155] In these two instances, researchers analysed former combatants in Colombia and the youth affected by the Israeli-Palestinian conflict. Among others, germane indicators explaining the outcome of experiment were seen in the capability of empathy and oxytocin.
[156] Together with the amygdala, it is also the insula, supramarginal gyrus, and temporal lobe.
[157] However, McSorley (2020, p14) is fully aware of the shortage of scientific analyses in this area, and he also acknowledges the importance of other senses which shall be inquired into in connexion to wars (see also McSorley 2013).

Furthermore, neither radicalisation nor extremist behaviour inclining to mass killings of innocent victims can ever be elucidated by a one-level study. Therefore, researchers will have to deal with manifold variables, eg, physiological, molecular, and socio-economic factors in order to better understand the terroristic mind. The ultimate question is, however, whether scholars of international relations are really willing to take part in neuro-international relations as a field. After reconsidering all the acquired knowledge on the human brain *"(…) many of international relations' favourite claims about our human nature need to be reanalysed"* as Holmes (2014, p225) sharply added in his critical paper, and he was not the only one (see also Hyde 2010).

3.3.2 Reflexions from the media

In the 1990s, a crucial shift took place in science because the financial resources were restricted. And therefore, scientists had to start communicating differently with the journalists in terms of sharing their findings and discoveries whilst using more appealing phrases (see Ackrill 1993; Nelkin 1999). The problems are then self-evident, since this greater general and journalistic attention is linked to larger error rates because articles must *(sic)* simplify the methodological procedures and conclusions. And thus, journalists focus on one cardinal piece of information. Putting an accent on this information then signifies an increase in tabloidization which shall claim potential readers' attention.[158] Owing to the growth of social media and Internet, scientists were given a chance to shake the journalistic environment and present their projects separately (Dudo 2015).

Dorothy Nelkin (1999) aptly noted that *"for most people, the reality of science is what they read in the press. They understand science less through experience or past education than through the filter of journalistic language and imagery"* (see also Nelkin 1995). In her

[158] As demonstrated in case of Spain, newspapers set up new sections focusing on scientific discoveries (COSCE 2006, p143).

unintentionally biased questionnaire survey,[159] Herculano-Houzel (2003) inquired which areas connected to neuroscience, and the brain in particular, were of greatest interests amongst potential readers (see also Herculano-Houzel 2002). Her research has pointed out that diseases and its treatment were found less appealing to readers. Instead, the findings, as depicted in Figure 10, exposed that articles focusing on memory, the process of learning, and emotions were drawn attention to. On aggregate, though, the most newsworthy topic has been linked to mind-reading within neurolaw (eg, Tallis 2007; Naish 2009) and the left-right scale due to its distinguishing and fiery character (eg, Mooney 2011; Mooney 2012a; Mooney 2012b; CBS News 2013; Resnic 2014; Resnick 2017; Zmigrod 2019).

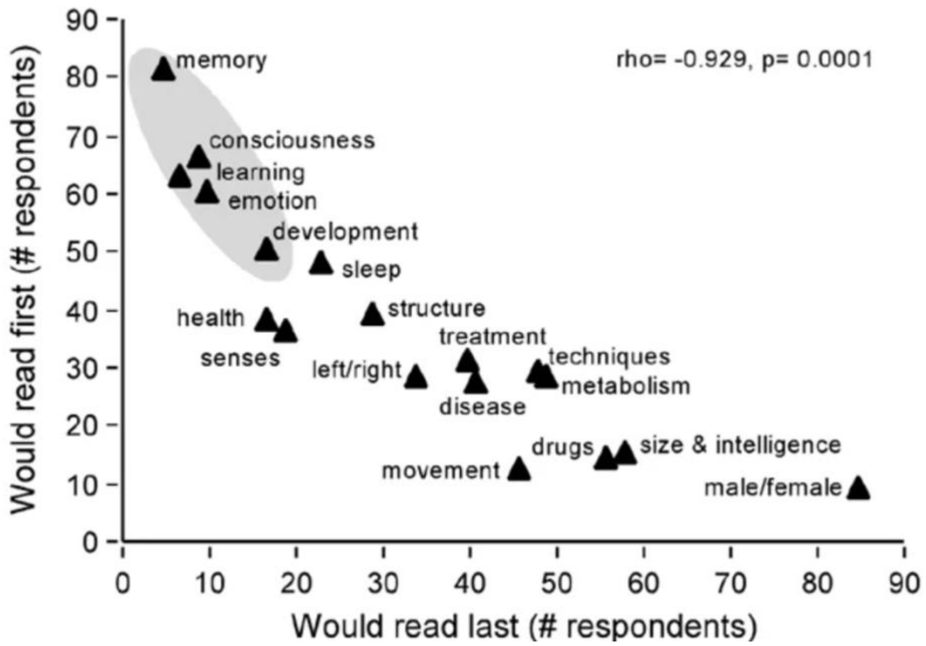

Figure 10 Neuroscience themes and its readerships
Source: Herculano-Houzel 2003, p325

Furthermore, this dividing aspect is easily related to broad (eg, Luksic, Howell 2014; Sánchez-Juárez 2019) or contemporary political affairs (eg, Kristof 2010; Dooley 2015; Rath 2016; Grossmann, Eibach 2020), and especially political neuromarketing

[159] The author (Herculano-Houzel 2003) admitted that the sample consisted of respondents who were either interested in neuroscience or they considered themselves to be members of intelligentsia.

(eg, Issenberg 2015; Randall 2015; Malkin, Randall 2015; Lieberman, Long 2018b; Álvarez 2019). According to Wardlaw et al. (2011) though, the public do not approve of the use of neuroscience in marketing. And in general, non-scientific readers worry about its eventual abuse. Therefore, delivering this type of alarming news attracts many possibly dismayed readers and thus increases the overall readability as necessary to the news websites and papers.

Although the growth of interest may be seen in the United Kingdom and the Continent as well (see BBC 2018; Harkness 2014; Taylor 2011; Yu 2018), demand and attention to social neuroscience used to dominate in the USA wherein the media has frequently discussed the role of neuroscience in politics and societal aspects (eg, Scutti 2016, Hayasaki 2016). As Nelkin (1999) claimed in case of America, newspaper publishers are not only important because of the size of its readerships, but newspapers and journals serve as a *"point of reference"* for manifold stakeholders in administration and other editorial offices. A 2007 New York Times article escalated into a backlash of scientists (see Iacoboni, Freedman, Kaplan 2007; The New York Times 2007), who sharply criticised the data and methodology in the original non-peer-reviewed article (see also Gruber 2019).[160; 161]

Hence, precision and medical ethics shall be regarded in relation to the media, as Haškovcová (2015, pp151–154) foregrounds. According to her summarisation, there are ethical codes for journalists, too. They are, however, the only authors and are not subject to authorisation in many publishing houses. For that reason, journalists are allowed to frame and adjust the content to their liking, frequently without assuming responsibility.[162] And it implies that neuroscience practitioners, physicians and even

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[160] Amongst these signed scientists, there were, for example, M D'Esposito, A Aron, R Poldrack, P Winkielman, and J T Cacioppo.

[161] Similarly, biased attitudes occurred in researchers' methods as well (Keim 2008).

[162] Yet it is not only journalists to be blamed, scientists' research project and their findings have acted misleadingly, too (Moore 2006).

managers should be vigilant and perfectly prepared when agreeing to undergo an interview, especially with television reporters (ibid, p152; Porter 2015).[163]

As of this May (2020), according to *Google,*[164] the occurrence of neuropolitics in the *News* section has scored the number of 302 articles, whilst the phrase "neuroscience + politics" has exhibited the incidence of 107,000 articles. Bearing in mind the fact that the Google settings predominantly considered the English-speaking websites and journals. In the Czech and Slovak newspapers, articles have also attempted to ponder upon neuroscience and its application in societal patterns and behaviour. The texts mostly reflexed and slowly followed the same directions of journalists in other parts of the world (see Růžička 2018), albeit in a very limited manner. On top of that, these articles usually adopted the information from foreign new agencies in the first place (eg, Týden 2015; Topky.sk 2015) or political neuromarketing was the only approach being highlighted (eg, Juřík 2015; Zoom 2015; Kasík 2018).

And finally, a thought-provoking tool calling attention to the rise of neuro-x fields may be seen through the *Google Books Ngram Viewer* tool due to its ability to visualise the rate of terms and phrases used in all the digitalised books in given periods from the 1800s up to nowadays. There is, however, a palpable obstacle, since, on the one hand, not every issued book has necessarily been digitalised so far. And on the other hand, one must bear in mind that this frequency-based analysis cannot be comprehensive, and in this case particularly, because it has included books written and issued in English only.[165] Yet some trends are already discernible as shown in Figure 11.[166]

It might be wrongly assumed that the trajectory of neurophilosophy could be expected to mirror in other neuro-x fields where an increase in interest had been

[163] Anderson (2007) briefly analysed the impact of the media on the youth in studies employing neuroscience. He highlighted that even further blanket training might be salient in this area.
[164] The figures correspond to the British version, *Google.co.uk* and its respective language and territorial setting.
[165] The incidence of neurolaw has been too negligible to be visible in the graph.
[166] Due to the time gap in the book digitalisation, 2015 was the last year included in the graph.

followed by a steep descent. The fact is, nonetheless, that neurophilosophy and neuroscience have evinced the most complex and intricate relation out of all neuro-x fields. And overall, indulging in speculations whether neuro-x fields will be on the upgrade or not would be vacuous. Yet the figures in % are still very low in comparison to other terms of political science, as for instance, democracy or ideology which, in the same time period, dominated in the middle of the 1990s with its peaks of 0.00340340049% and 0.00240073895% for the latter. Whereas neuroeconomics has been the most noticeable representative of neuro-x fields, neuropolitics has lagged behind quite notably. Finally, neuroethics, serving as a *"guardian"* (De Vries 2007), and neuromarketing have experienced a similar route of rise because of its interconnexion and dependence. In this regard, O'Connell et al. (2011, pp632–3) accentuated the importance of independent peer-reviews which have emerged thanks to the omnipotence of the Internet. These *"blogosphere"* peer-reviews critically accompany primary peer-reviews in the scientific environment overstocked with articles.

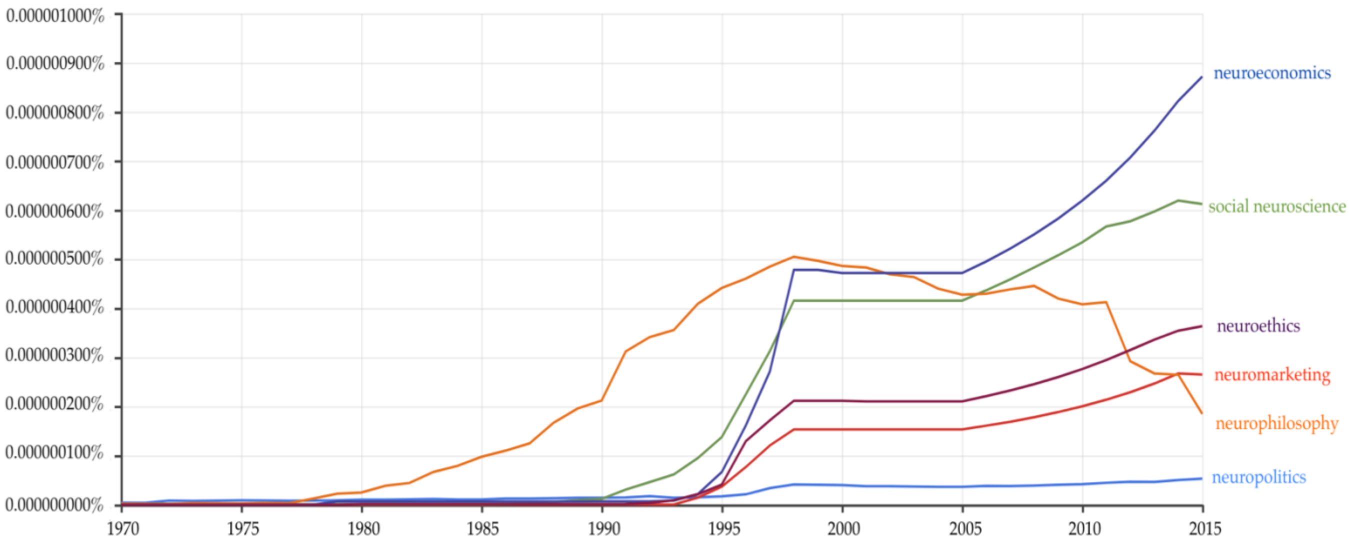

Figure 11 The neuro-x fields fluctuation in the books (1970–2015)
Source: Author via *Google Ngram Viewer* (2020)

4 METHODS AND INSTRUMENTS OF NEUROPOLITICS[167]

Neuropolitics elaborates on already used methods and techniques of sociology and political science, but it also adds the tools of neuroscience. As Ölçekciler (2017) notes, political research, grounded in neuroscientific studies and the use of neuroscience as such, may be seen as the *third way* amplifying on qualitative and quantitative research methods as these two used to be known and practised before neuroscience became prominent. According to Olteanu (2015), there are three predominant tools that have been preferred by neuromarketing and social neuroscience practitioners, functional magnetic resonance imaging (fMRI), followed by electroencephalography (EEG), and eye tracking.[168] Specifically, though, the origins of relations and connexions between biological processes and political attributes and behaviour lie in psychological analyses which have been akin to physiology.

Among various psychological test and experiments, especially the Implicit Association Test (IAT), identifying biased and (less) tolerant attitudes in human nature when analysing subconscious associations, has been on the upgrade in the last decades from the late 1990s (cf, Greenwald et al. 1998; Greenwald et al. 2009). This testing has been used to recognise, for example, racism, discrimination and tolerance among

[167] In this thesis, the way in which tools have been divided into should not be dogmatically understood as the only correct one. Other schematic conception has been suggested by Vincent (2010, p3), who subdivided the tools into three groups: non-invasive and invasive techniques and radiology, within which she categorised CAT/CT as an ionising radiation technique, SPECT and PET as radioactive isotopes techniques, and finally, MRI, fMRI, and diffusion tensor or spectral imaging (DTI / DSI) as magnetic field-based tools.

[168] There are even other tools of neuroscience, such as computed tomography (CT or CAT), steady state tomography (SST), transcranial magnetic stimulation (TMS), Stereoelectroencephalography (SEEG), near-infrared spectroscopy (NIRS), transcranial direct-current stimulation (TDCS), transcranial magnetic stimulation (TMS). The aforementioned tools, however, are not frequent in non-clinical conditions and are not truly suitable for neuropolitics. There are three reasons for that. First, in comparison with other instruments, the findings are not utilisable from these tools or the usability is very limited. Secondly, the tools represent more complex approaches using radiation or invasive approaches, and overall, the data interpretation is convoluted. Finally, it is the high financial demands caused by the use of these tools as complementing or primary sources. The fact is that neuroscience itself remains costly, and it is crucial to bear this in mind when preparing a research project (cf, eg, Bridger 2017; Paszkiel 2020).

participants (see Xu, Nosek, Greenwald 2014). In defiance of critics who oppose the use of only four label categories *(men, women, good, and bad)* and its reliability, the IAT has been proved to be a valid indicator. For political matters, meta-analyses (eg, Greenwald et al. 2009) even endorsed the ability of this test to predict political behaviour and political preferences (Nosek et al. 2007).

Another psychological method is based on facial coding. It goes back to the 1870s and Charles Darwin's work.[169] According to the scholar, facial expressions of both, ie, human beings and animals, may differ slightly. A vast majority is, however, subject to the same pattern and thus facial expressions are congenital, meaning not anything that could be learnt. Currently, the method discerns four prime facial expression that are depicted in Figure 12. These expressions are controlled and run by 43 facial muscles (Wilson 2017). Two of them then play an indispensable role for recordings by another tool, facial electromyography (fEMG), as employed in this thesis. Nowadays, facial coding is conditioned by algorithms. And even though facial coding concentrates on more muscles and does not consider only two as in case of fEMG, it is not suitable to state that one method is more sufficient than the other, since the appropriateness depends on the form of research and research questions (ibid).

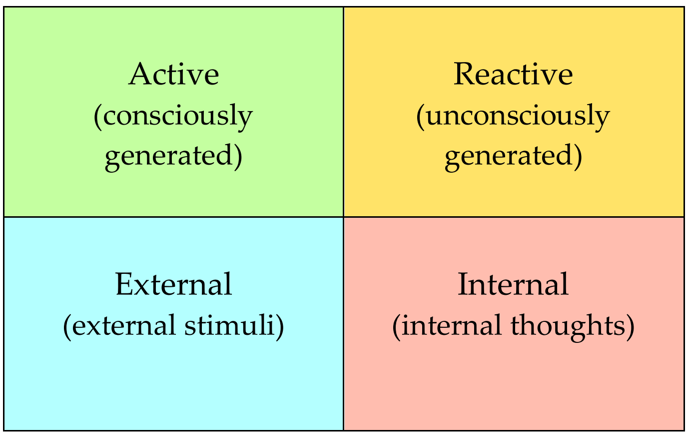

Figure 12 Classification of facial expressions
Source: Wilson 2017

[169] His book *The Expression of the Emotions in Man and Animals* was published in 1872.

4.1 Experimental political science

Karl W Deutsch (1972, p28), a well-known political scientist, claimed that *"[experiments] can help us in measuring or estimating some crucial parameters of political or social processes in cases where out theories have told us that a particular magnitude is important"*. Notwithstanding the groundless assumptions that experiments are novelty of political science, they actually are dated to the 1920s when first endeavours to scientise this social discipline initially appeared in Chicago (see Morton, Williams 2008; 2010). Owing to the 1950s behaviouralism, scientific approaches were intensified and more widely accepted. It is necessary, however, to realise that it had remained a *"marginal heterodoxy"* by that time (Adcock, Bevir 2007, p210; 214). [170] Nonetheless, experiments in political science have its origins in psychology and its first experiments of W Wundt taking place in 1879.[171] These initial efforts had been strongly criticised by the *postmodernist* scholars who were opposing the idea of experiments in social sciences (Capaldi, Proctor 2003, p24).

As Kittel, Luhan and Morton (2012, p2) note, modern roots of experiments in political science, arising in the mid 1990s, may be spotted in both psychology and economy. The patronising political psychology then incorporated and employed its methods so that political phenomena could be analysed from psychological angles (Haste, Jones, Monroe 2016, p309). Hence, Lavine (2010, pxlviii) stresses the fact that political psychology and respective biologically based research studies illustrate that politics itself is not merely about elections, gains, campaigning and power, there are also other factors rooted in *"psychological predispositions, attachments, needs, and bounded information-processing capacities (…) shaping and constraining how individuals interact with their government and society at large"*. Inasmuch as until the 1990s, political

[170] The authors even conclude that primarily in the 1940s, it was the group of political theorists who attacked the scientific-oriented theorists and had considered this approach to be immature and not sufficient enough to analyse political behaviour (Adcock, Bevir 2007).

[171] By the end of 1980s, the Milgram's obedience test was another key bid for a further expansion of experimental political science (Stone et al. 2014).

experimentations had remained less frequent, and this had mirrored in both the number of articles using experimental methods and journals specialised in this area of research, Morton and Williams (2010, p3) observed a *"low standing [of experiments] within the discipline"*. Subsequently, political science has experienced a rise in the number of books, mostly in the forms of handbooks, focusing concretely on experiments in this area (eg, Laponce, Smoker 1972; Morton, Williams 2010; Druckman, Green, Kuklinski, Lupia 2011; Kittel, Luhan, Morton 2012; Keman, Woldendorp 2016).

Even nowadays, there is a certain disagreement whether experimental political science has managed to become a developed branch of the discipline. While Druckman et al. (2011, p22) state that it is *"still in its infancy"*,[172] McGraw believes that *"it has come of age"* (1998, p782). This further exemplifies another dispute over explanations and conclusions of social sciences in a philosophical, and not a methodological, perspective. Scholars may be divided into two *"incompatible"* groups as *naturalists* and *anti-naturalists* (see Bevir, Blakely 2016, pp31–32). Whereas the former group emphasises the importance of strictly ahistorical analyses, the latter, by contrast, prefers analytical philosophy based on phenomenology and idealism. In political science, in particular, it is assumed that political matters and behaviour can be atomised into smaller units, as represented in the work of G Almond and S Verba,[173] or reversely, politics cannot be atomised and is thus based on a *"holistic web of beliefs"* (ibid, p31; p33).[174] Most importantly, Hyde (2010, pp75–76) remarked that regular topics, such as wars, conflicts or international relations, could not be randomised as common in experimentation. However, the research design shall be able to shift the

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[172] Morton and Williams (2010, p12) mentioned, for instance E Ostrom who has been known for a very sceptical attitude towards the use of experiments in political science.

[173] Corning (1971) therefore highlighted the importance of Darwinian and Mendelian's contribution to the theory of evolution.

[174] As examples of scholars, Bevir and Blakely (2007, p31) specified that naturalists may be found within the *Vienna circle, English empiricism* and *logical positivism*, while anti-naturalists are associated with the *post-Wittgensteinian* philosophers and *German Romanticism*. Modern roots then resides in the *post-structuralist* work of M Foucault, or contrary, in C Taylor's *hermeneutics.*

foci at the individual level of research which might be relatable to the greater communities or even states.[175]

But what does an experiment actually signify? Druckman et al. (2011, p4) summed up this method, taking place in a laboratory or field, as a *"deliberative test of a causal proposition, typically with random assignment to conditions. Investigators design experiments to evaluate the causal impacts of potentially informative variables".* When classifying experiments into respective categories, three may be found then. It is the laboratory or field research, and these are occasionally but not always complemented by surveys (cf, Kittel, Luhan, Morton 2012; Morton, Williams 2008). All of the aforesaid types may be even overlapping. Three ensuing characters of conducted experiments may be discerned.[176] These are *basic, applied*, and *programmes evaluating*. While the first one aims to elaborate on issues at a general level, applied research attempts to solve and settle problematic queries. The third approach functions as an interpretative study in Lijphart's perception (1971), and its objective is to test various theories specifically delivered for this purpose or test the changes affected or caused by sundry political institutions. And for that reason, some scholars (eg, Stangor 2011) include the third type as a subcategory of applied research (Leary 2012, p4). Another classification has been used by Ashby and Valentin (2018, p307) who focused on the outcome. According to their text, there are categorisation and identification experiments. Whereas the former is meant to divide the examined units into groups, the latter aims to identify one certain variable. Furthermore, in the course of preparing and conducting an experiment, it is possible to deflect from a regular experiment, specific for allowing the examined participants to do as they wish, to a *stimulation* of which participants are very much led or manipulated to certain targets (Morton, William 2008, p343).[177]

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[175] For that reason, the Hyde (2010) opposed the traditional theory of international relations as delivered by Waltz.

[176] There are many specific details of experimental designs which should be taken into account before conducting any research in social sciences (see Lintern 2007; Jacoby, Siminoff 2008).

[177] Quasi-experiments, as clarified by Brady (2008), might be explained through J S Mill's *Method of Difference* because participants' spontaneous reactions to stimuli or other situations are only in a limited

A list of advantages and disadvantages must be recalled as well. In their summarising chapter *"The art of laboratory experimentation"*, Wilson, Aronson and Carlsmith (2010) engaged mostly in positive aspects of experimental investigations. Some of them are palpable and may be found across the literature dedicated to research methods in (non)clinical conditions (see McDermott 2002, p38). On the whole, it is the eventuality of modelling the situations and indeed, the *"ability to maximise internal validity"* (Stangor 2011, p273). By contrast, researchers should be aware, above all, of the perils. First and foremost, external validity dominates the list of disadvantages. External validity is crucial especially when applying to political matters because, as noted by Somit (1968, p560), the conditionality caused by given social surroundings and biological attributes should not be omitted. Secondly, experiments conducted under the laboratory conditions are burdened with a factitious milieu (McDermott 2002, p39). This point has been expanded upon by Kellstedt and Whitten (2018, p88) who counterpointed that not every dependent variable might be controlled. Thirdly, experimental biases or concealed independent variables may play a negative role in delivering the findings. Last but not least, there are ethical obstacles to consider.[178] For dealing with ethical consequences, *equipoise* is then salient, since it convinces researchers to familiarise themselves with the inquired issue whilst knowing certain limits in order not to manipulate the variables and hypotheses (Kraemer 2013, p214).[179]

Apart from the contributions of experimental investigations to political science in the field of public opinion, decision-making or public policy, for instance (see

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scale. Therefore, quasi-experiments lack of the possibility to randomise (see Brady 2008; Stangor 2011; Silva, Bickle 2009, pp117–119).

[178] Even though Kellstedt and Whitten (2018, p88) mention ethics, they only state that *"[ethical problems] arise less frequently and typically less dramatically (…) but they do rise on occasion".* This rather plain comment cannot stand the test of neuropolitics or other physiologically oriented experiments which are no longer mere decision-making games based on economics.

[179] According to Gravetter and Forzano (2012), researchers and neuroscience practitioners should understand the double-edge character of ethical issues and therefore, they should include themselves as well, which implies that their research project shall be registered, and plagiarism should be avoided. Three stages of ethical considerations are built in *Subchapter 5.4.2 Codes of neuroethics*.

McGraw 1998); currently, experimental and neuro or physiologically influenced political research has been burdened by the *"unidimensional approach"* represented by the left-right scale (Feldman 2013, p594). In this context, Feldman (ibid) has brought back the theory of Converse whose finding indicated that the Americans were not in possession of strong political beliefs, and thus *"non-attitudes"* prevailed amongst them instead. These findings then resulted in further debates, especially in connexion to the applicability of American system of political beliefs abroad (cf, Converse 1970; Pierce, Rose 1974; Zmigrod, Rentfrow, Robbins 2019). When referring to Converse's texts once again, an analogous situation was outlined by Lavine (2010, pXXXIV) for the purpose of segmenting politicians and voters as two separate groups, ie, elites and the masses. Their ideological beliefs experience a dissimilar strength, since *"the [American] citizens lack the cognitive wherewithal to organise their political opinions in a coherent way"*.

In conclusion, Lijphart's influential text (1971, p684) summarised that, in defiance of obvious control difficulties, experiments *"provide the closest approximation to the ideal"*. This assumption has been adopted by Kováč and Hyde (2002; 2010) who both have backed the significance of experimentations in political science in order to stress the overall fragility of democracy and the European Union (EU), especially in relation to the end of the Cold War. Nevertheless, a unilateral presumption, as seen in the work of Somit (1968), accentuating biology as a teaching means which may provide political science with new information, might be overruled if the tools are employed accurately. Afterwards, political science could also bring new sets of information to biology too as long as these two disciplines form equalised relations.

4.2 Cerebral metabolic activity measurement

For additional theoretical analyses specialising in connexions taking place in the central nervous system (CNS), the last decades have also witnessed a growth of studies which were fused by a specific method known as computational neuroscience. Its roots are associated with the annual *Computational Neuroscience (CNS) meetings* starting in 1992 (Miller, Bower 2013).[180] This field then combines neurobiological data with mathematical procedures and computations,[181] and it is represented by dissimilarities between the groups of *"wet biologists against dry computationalists"* (Lytton 2002, p22), who express their disagreement with one another.[182] In a general sense and illustrated in the auxiliary Figure 13, computational neuroscience *"uncovers the principles and mechanisms that guide the development, organisation, information-processing, and mental abilities of the nervous system"* (Trappenberg 2010, p1). Computational methods model broad biological situations at a very high level of complexity (see Feng 2004; Cisek, Drew, Kalaska 2007; Mallot 2013), and hence merely traditional analytical attempts would be useless without modern technologies and its storage abilities. Without sufficient room for storage, modelling cannot detect and describe the CNS as a whole. Neural encoding, an indispensable and regular part for computing, examines neurons and its action potentials, known as *spikes*, that are spread by the neuron in pattern-oriented intervals which as time-based too. Neural encoding then inquires the way in which stimuli mirrors in action potentials (Dayan, Abbott 2001, p4).

Sterrat et al. (2011, p317) identified three basic trajectories of computational neuroscience research for the near future, and these included neural protheses, clinical

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[180] Before this modern era though, pioneering studies may be found even in the 1930s with a full chance to bloom in the 1950s (Sterrat et al. 2011, p314)

[181] A reverse definition angle states that the brain is being studied as a computer responsible for given neural activities.

[182] Lytton (2002, p16) simplified the objectives of computational neuroscience in accordance with the corresponding field in the research project and its approaches, be it bottom-up or top-down, and thus ranging from physics, chemistry, cell biology, computer science, neurology, and psychology to respective foci as ions, transmitters and receptors, neurons, networks, systems, and behaviour.

application, and most importantly for political science, connexions between the theory and model which, *sensu lato*, may be seen as Lijphart's (1971) interpretative studies (cf, Busemeyer et al. 2015, pp279–390).[183] Analogously in line with Teufel and Fletcher (2016) dealing with psychiatry, Charpentier and O'Doherty (2018) pertained the use of computational neuroscience to social neuroscience, and they ascertained that the assets equalise and even outweigh the perils of its use. Milkowski (2013, pp177–201) has delivered a comprehensive outline of critical points regarding computational neuroscience starting from the method itself because of its use of modelling, which still reduces and simplifies sets of information and its reality; up to the problematic generalisation efforts (see Gurney 2009, p108). Overall, a palpable problem is that the human brain *"denies any clarity and simplicity"*, as Lytton concludes (2002, p20).

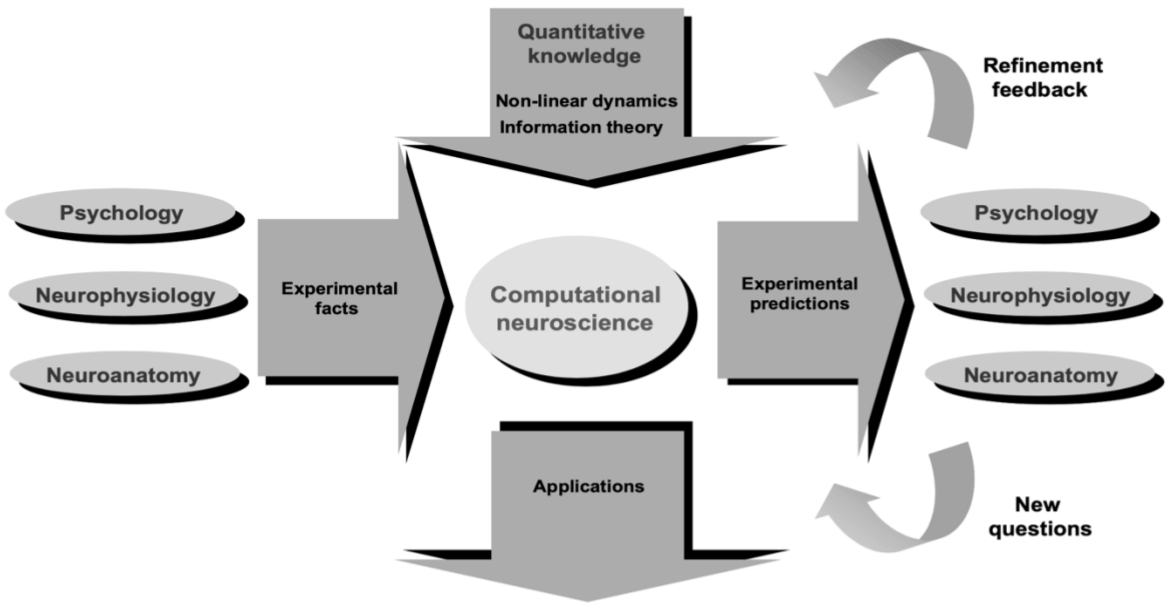

Figure 13 The mission of computational neuroscience
Source: Trappenberg 2010, p3

[183] For instance, a relevant attempt to add more computational science to political science may be seen in the book of Voinea (2016), who has used both computational and simulation models.

4.2.1 Positron Emission Tomography (PET)

As clear from the name itself, the technique known as Positron Emission Tomography (PET) makes use of positron emissions, so-called radionuclides, which emit positively charged particles in the course of radioactive decay. The cyclotron-generated radioisotopes decay by the emission of positrons or positive charged electrons (Ladley 2018, p2665–2666).[184] PET is thus based on an intravenous injection of radionucleotides and a necessary time of coming to contact with ionising radiation (Rana, Zumo, Sim 2013, p9), which still makes the technique *"relatively non-invasive"* (Ladley 2018, p2666). The method is based on the radioactive molecules (fluorine)[185] decay as a reaction to glucose-metabolism in the human brain. As a consequence, there are two types of ray radiating in a direction leading apart (Procházka, Koranda, Korandová 2017, p98). The fact is that PET measures the gamma (γ) radiation, but it is necessary to employ even other equipment, eg, computed tomography (CT) or magnetic resonance imaging (MRI), in order to obtain better and more precise results in respect of the brain localisation (ibid; Seidl 2015). This aspect, nevertheless, makes the utilisation of PET even more arduous and expensive as well.

For research or medical examinations, there are two options how the human brain can be analysed. The first one is based on the *resting brain* which aims to study the participant's brain in a resting position, thus without any specified assignments. The other one focuses on the *active brain* when participants are given a task to fulfil so that the digital correlates of baseline cerebral blood flow, for instance, can be observed (Ladley 2018, p2666).

From a practical side, the tool may be rather time-consuming too because the examined participant should have been empty stomached for at least 6 hours before the procedure. If this rule were not followed, the scan images would become distorted

[184] While PET investigates the positron emission, a single photon emission computed tomography (SPECT) scan focuses on the gamma (γ) radiation.
[185] It is especially ^{18}F-FDG[2-deoxy-2-(^{18}F)fluoro-D-glucose], labelled as Fluorine ^{18}F, that is the most used substance (Procházka, Koranda, Sedláčková 2017, p98).

and/or the contrast would be significantly worsened by a higher rate of glucose. There is then a period of 60 minutes from the injection application to the examination itself which is expected to last approximately 45 minutes in total (Seidl 2015, p126), since the half-life of ^{18}F is 110 minutes.

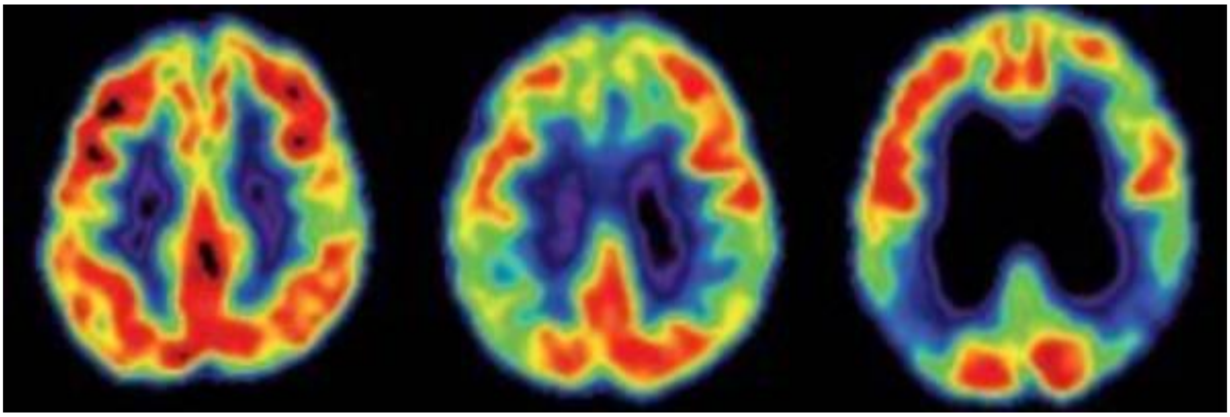

Figure 14 PET scan images in instances
Source: Pacific Brain Health Centre 2020

Even though PET as a tool has been used in cardiology, oncology and neurology thanks to its ability to diagnose the presence of tumours and Alzheimer disease because the brain activity, if correctly interpreted, is then depicted rigorously (Rana, Zumo, Sim 2013). As showed in Figure 14, three significantly different scans discern amongst (from the left) the healthy and normal brain, the brain with mild cognitive impairment, and finally, the human brain affected by Alzheimer disease. Regardless of some initial attempts to recognise PET as a tool suitable for neuromarketing (eg, Gould, Porrino, Nader 2012; Thomas, Cassady, Heller 2017), not only a mere medical instrument, but the number of disadvantages exceeds the positive merits in this case, as summarised in the SWOT analysis below. Within the main negative sides, it is key to consider the possibility of allergic reactions to the used substance or radiation exposures. In addition, owing to radioisotopes' rapid period of decay, PET may be considered to be the first stage of fMRI. (Sharma 2011, p1751).

S	W	O	T
Ability to study depth metabolic processes	The need of CT or MRI as additional tools	New findings on emotional and sensory recognition	Patients' physiological reactions to measurement
High and good quality spatial resolution	Seriously high costs up to £700 per one scan[186]	Political neuromarketing potential	Radiation and allergic reactions
Ability to study cognitive behaviour (especially in the dlPFC)	Radioactive materials, rays, and its use	Working memory and addiction-based research	Incidental findings
Possibility to *"measure"* and dismantle the course of emotions processing	Short periods of functioning and a long time for preparations needed	Studies on connexions between political attitudes and diseases	Neuroethics questioning the possible abuse of mental privacy

Table 3 SWOT analysis for PET

4.2.2 Magnetic Resonance Imaging (MRI)

The origins of magnetic resonance imaging (MRI) are dated to the end of the Second World War (Seidl 2015). However, it took some time until its pioneering employment in the 1980s. And since the device has been improved sufficiently, its scan images are of the same importance as computed tomography (CT) due to, for example, its high sensitivity to the occurrence of irregularities, spatial resolution, multiplanar imagining capability, and the ionizing radiation deficiency (Lopez 2011, p1508). MRI has proved to be an excellent tool for concentrating on the participants with traumatic brain injuries (TBI) and epilepsy.

[186] This price was revealed by the *Ontario PET Steering Committee*. However, the cost included a pay for a physician to interpret the scan (Ontario PET Steering Committee 2008, p3). The exchange rate was recalculated to correspond to January 2020).

Sharma (2011, p1750) adds that there are three main components of MRI: the primary magnet, gradient magnets, and a coil. The final colour of tissue, as depicted in the MRI scans as Figure 15, is represented by a greyish scale of the human brain in which a lighter grey colour shade implies *hyperintensity*, a darker colour then stands for *hypointensity*. The signal roots in the hydrogen atom, inasmuch as it is approximately 1,000 times stronger than any other element of the human body (Seidl 2015, p121). Crucially, it is not any contrasting agent being visualised in the scan, but the signal change instead (Rana, Zumo, Sim 2013, p8).

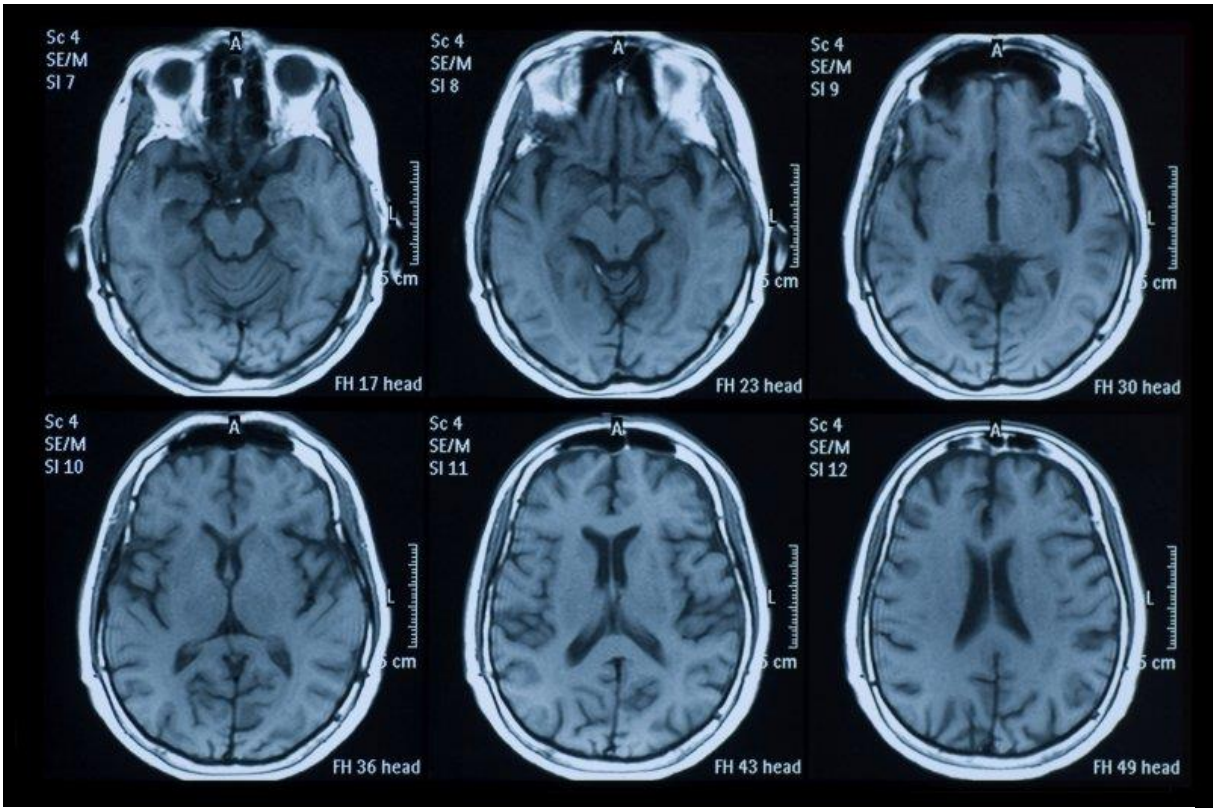

Figure 15 MRI scan images in instances
Source: Kedmey 2014

The contribution to political science lies in its non-invasive and non-radioactive ability to allocate the brain areas, it also *"depicts the relationship of the substrate to the eloquent regions of the brains"* (Lopez 2011, p1508). Owing to the fact that these are the regions dealing with motor, speech, and memory functioning, it is evident that neuropolitics could avail of it. Nevertheless, the principles of this technique are *"rather* *complicated"* (Seidl 2015, p121), and the price keeps growing in comparison with PET (Rana, Zumo, Sim 2013) because not only the tool itself is rather expensive, even the respective components of equipment exemplify the financial demands. Moreover, MRI cannot be employed with participants who are claustrophobic and/or unable to remain in a strictly still position (Sharma 2011).

4.2.2.1 Functional Magnetic Resonance Imaging (fMRI)

Even though the mutual liaison between the neural activity and blood flow has been known since the 1890s (Wylie, Kucukboyaci 2018), the last decades of the 21st century have brought a significant enhancement in visualising techniques, and functional magnetic resonance is amongst the most prevailing ones due to its ability to track active regions, the ROIs, in certain periods of examination (Berns 1999; Buxton 2009). As in case of other methods of functional imaging (eg, SPECT, PET, MEG or EEG), the objective is to *"correlate cognition and behaviour with neural activity […] in order to evaluate brain-behaviour relationships"* (Zafonte, Kurowski 2011, p1111). Functional magnetic resonance imaging (fMRI) visualises how the human brain actively reacted to given stimuli. Critically important in medical conditions, this technique shows the regions and cortex that have or have not been pathologically, meaning negatively, affected and thus shall undergo a neurosurgical intervention (Seidl 2015).

Technically, this non-invasive tool *indirectly*[187] observes the neuron activity on the basis of *"local changes in oxygenation and perfusion (ie, the blood flow rate) of the cerebral mantle"* (Procházka, Koranda, Sedláčková 2017, p105). Forasmuch as iron is present in the blood as an oxygen-carrier of haemoglobin, deoxyhaemoglobin, ie, iron without being tied to oxygen, is then to be blamed for deflections within the magnetic field (Zurawicki 2010, p44; Olteanu 2015). Therefore, fMRI makes use of the BOLD effect[188]

[187] By contrast, EEG and MEG both measure and record the changes *directly* (Wylie, Kucukboyaci 2018, p1525)

[188] Buxton (2009, pp341–367) described the BOLD effect from both the historical and biologically functional perspective. BOLD itself stands for the blood oxygenation level dependency.

which states that *"in activated areas of the brain, venous blood is more oxygenated because of the increased local blood flow with little change in oxygen consumption"* (Rana, Zumo, Sim 2013, p9).[189] An increased activity of neurons implies that their need of oxygen and glucose arises (Wylie, Kucukboyaci 2018).

Figure 16 fMRI scanner
Source: Devlin 2020

If fMRI is employed, it is essential to combine it with MRI in order to improve the data and moreover, to interpret the findings (Zafonte, Kurowski 2011). For research and currently even the clinical purposes, two types of investigation may be identified, *block design* and *event-related design*. The former, known as the *boxcar* or *van design*, specialises in inquiring one experimental condition for the whole period of time, whereas in the latter, various conditions and stimuli are shuffled. It is crucial then to make certain that there is enough of these stimuli, otherwise it would not be feasible to test the presence of these randomly shuffled conditions as stimuli. In comparison with the block design, the latter also corresponds to the cognitive aspect of behaviour that are more relevant to political science, since its greater scale of scan images may be

[189] Accordingly, there are two techniques how the cerebral cortex may be mapped. Firstly, it is via the perfusion fMRI-based approach. It analyses the changes in the blood volume and blood flow rate in spots of ongoing neural activity. Secondly, and more frequently in use, it is BOLD fMRI which examines the proportion of oxygenated and deoxygenated haemoglobin (Procházka, Koranda, Sedláčková 2017, p106).

more plausible (Wylie, Kucukboyaci 2018, pp1527–1528). An instance of fMRI scanning at $p < 0.05$ is depicted in Figure 17. Whilst studying the right *(a)* and left *(b)* amygdala, the study exposed the existence of liaisons between the participants' nasal sensitivity (symbolised in green) and their greater size of social networks (symbolised in red). The overlap is then manifested in yellow (Zou et al. 2016).[190] And another contemporary study (Friesen et al. 2020) provided evidence that the androstenone, a type of pheromone, and its detection adverted to different political attitudes and leanings.

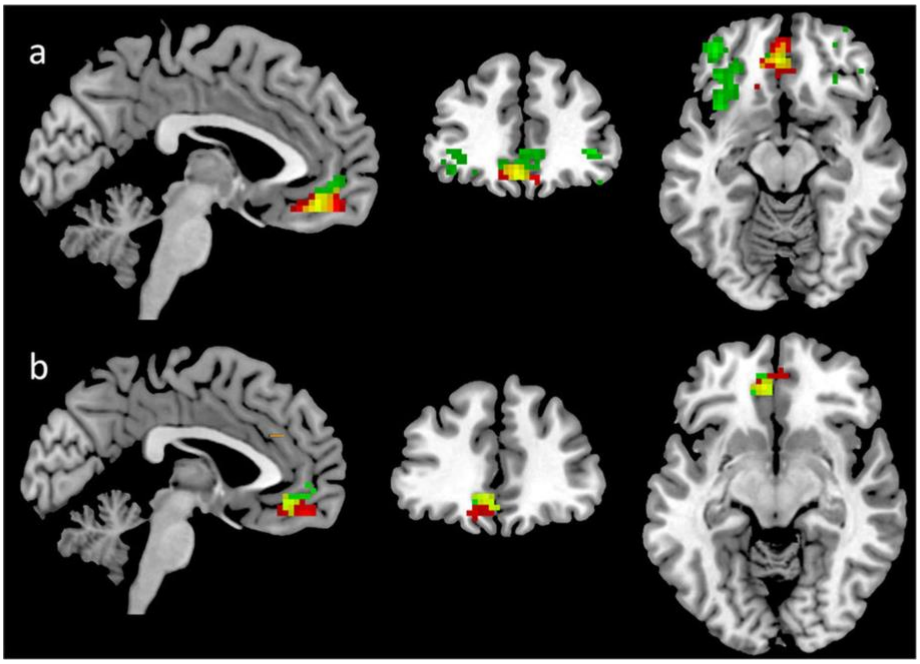

Figure 17 Functional connectivity in an fMRI study
Source: Zou et al. 2016, p3

Overall, the experimental procedure itself expects the participant to remain in a strictly still position in the scanning device as showed in Figure 16. While lying on one's back, the head is encircled by a great magnet of which aim is to align the participant's protons with the inner magnetic field. Therefore, as in case of MRI, this technique is not suitable for claustrophobic participants. Subsequently, the neural activity, exemplified by a dilation of blood vessels, results in a blood increase within

[190] Interestingly, this relation is not reciprocal because a greater size of social network was not reflected in the nasal sensitivity (Zou et al. 2016).

active regions (Zurawicki 2010, p44). At this stage, however, several scanning procedures are mandatory because fMRI is not able to deliver standardised figures. Therefore, having the brain scanned in two fundamental paces, resting and active, cannot provide the researcher with any sufficient data, meaning that dozens of scanning measurements (usually approximately 40) in active processing and then in resting positions are always indispensable for every following statistical processing (Procházka, Koranda, Sedláčková 2017). Even though there is no use of injections, nor radioactive isotopes, which makes the procedure faster in its course than PET, the brain preceptors are recognised more conclusively by PET instead (Sharma 2011, p1751).[191]

Although fMRI has already been on the upgrade amongst neuromarketing practitioners (see Hubert et al. 2018) thanks to a declared ability to comprehend the biological roots of individuals and their brain processes, and thus *forecast* consumer or even political behaviour, it is very much balanced out due to problems caused by inaccurate interpretations (Sacchet, Knutson 2013) and complex aspects lying from within the tool. When bearing in mind the limitations of fMRI, there are many to ponder upon. Clare and Johansen-Berg (2020) have summarised them into four main limiting factors:

i, Indirectness of measurement

It cannot be clarified whether the recorded activity was of neural or physiological origins. In defiance of better results than in case of psychological investigations, the fMRI findings still remain non-quantitative in essence.

ii, Spatial resolution

fMRI is based on the blood flow, and since its speed is low, this tool is not able to measure the activity at the level of sub-milliseconds in which neurons function.

iii, Omitting the brain interconnexions

[191] As Sharma (2011) mentioned, the fMRI results in image resolutions achieved a better quality, approximately 1.5 mm by 1.5 mm.

Many experiments, according to this point, specialise in less relevant or important research questions, meaning that a poorly delivered hypothesis on one certain area being active when observing an item leads to the failure to examine and consider anything more but the initially picked area. The authors agreed that the first point together with the third one downgraded fMRI, making it only *"modern-day phrenology"*.

iv, Neuroethics

A specific category of queries what is to be done with the data, findings, and who is to approve of the experiment.

S	W	O	T
Ability to study desires and emotions	High costs, significantly exceeding the cost calculated in case of PET	Deeper analyses on political and ethical attitudes from a normative perspective	Subjects' potential claustrophobia and inability to remain strictly still while scanned
Ability to find locations of neural activity	The need of MRI possession in case of fMRI	Political neuromarketing potential when analysing the brand appearances and loyalty towards them	Neuroethical questioning of the possible abuse of mental privacy
Ability to study human memory	Low temporal resolution[192]	Power-related attitudes may be scrutinised	Incidental findings
Ability to focus on certain brain areas and its relation to respective political attitudes and personality traits	Exacerbating conditions for interpreting the scan images	Possibility to foresee the voting behaviour with the corresponding process of decision making	Possible abuses in respect of deeper behavioural patterns in order to manipulate the sample or society

Table 4 SWOT analysis for MRI and fMRI

[192] A higher temporal resolution is then conditioned by more expensive versions of fMRI which may soar the price even up to £2.5mil.

4.3 Cerebral electric activity measurement

Notwithstanding EEG as a pivotal representative of this category, there is at least one more tool which should be briefly mentioned and characterised, and it is magnetoencephalography (MEG). In defiance of some similarities between these two non-invasive techniques, EEG examines and measures brain potentials, while MEG, by contrast, focuses on magnetic fields formed by electrical activity in the neurons (Sharma 2011, p1571). In comparison to EEG, there is a higher temporal resolution, and thus a better accuracy which is, however, counterbalanced by a lower spatial resolution.

Most importantly, as an instrument that helps localise and functionally map the inquired (non)pathological region, MEG is often employed to bring particularly *"complementary"* (Hammond, Grafton 2011, p1509) data findings. Thereof, Paszkiel (2020, p7) described MEG as *"neurofeedback"*. MEG uses a superconducting quantum interference device (SQUID), very sensitive magnetometers, to measure the magnetic fields (Clare, Johansen-Berg 2020). Nevertheless, in respect of practical use, MEG must be used in a separate laboratory due to the strong magnetic fields generated in the course of measurement (Paszkiel 2020). And in this environment as depicted in Figure 18, it is difficult to employ MEG in other than non-clinical conditions (see Paetau 2002).

Figure 18 MEG scanner

BraceWorks 2018

4.3.1 Electroencephalography (EEG)

For a method, the roots of electroencephalography (EEG) may be found in the 19th century. EEG has been realised and implemented, however, a bit later, from the 1920s.[193] The initial breakthrough in research is associated with Richard Caton, a British physiologist, who had detected the presence of electrical activity in the human brain in 1987 (Whyte 2011, p937).[194] Nevertheless, the then technological equipment had not been so advanced to elaborate on and put into practice Caton's claims. EEG has become an important tool able to consequently examine various disorders, such as epilepsy, sleep[195] and brain disorders, including the brain death (Weintraub, Whyte 2018, p1282).

First and foremost, it is necessary to comprehend what EEG observes and what data can be expected. As previously mentioned in the *Literature review*, a certain level of oversimplification amongst neuromarketing and non-medically trained practitioners has left to a rise of misunderstanding of what is and is not feasible and what neuroethical consequences are to be considered afterwards. Simply having stated that EEG *"shows the brain activity"* (Zurawicki 2010, p48) cannot be sufficient. Specifically, the tool records *"ongoing spontaneous (*Weintraub, Whyte 2018, p1282*) (…) bioelectric activity of muscles and the speed of nerves after having electric (electroneurography) or repetitive stimuli imposed"* (Seidl 2015, p130).[196] The recording of this activity functions as a time series founded on many frequencies.[197] And the means of electrical

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[193] In 1924, Hans Berger, a German psychiatrist, discovered two fundamental waves (alpha and beta waves) that are crucial to electroencephalography. The alpha wave was then renamed as the *Berger wave* (Procházka, Koranda, Korandová 2017, pp85–86).
[194] Another outstanding scientist connected to the development of EEG was William Grey Walter (see Hayward 2001).
[195] As Seidl notes (2015), EEG may be employed either in the morning or in the course of the whole night whilst the participants are asleep.
[196] Recordings from the measurement are not enough to satisfy the research needs because the analyses must be based on *"normative patterns of brain electrical activity, including the predominant frequencies, amplitudes, and degree of coherence"*, as Weintraub and Whyte emphasise (2018, p1282).
[197] In this aspect, it is the thalamus and grey matter in the forebrain, that are responsible for the brain oscillations, and these may be then measured by electrodes (ibid).

activity are transformed into brain waves of which divergences are primary measured by EEG (Olteanu 2015).[198]

EEG research uses a cap with electrodes, and these are glued to the skin. There are sundry types of EEG caps and they vary accordingly. An example of EEG cap is showed in Figure 12. The most frequent cap uses 19 active electrodes which are placed in accordance with the *International 10-20 system* that is depicted in Figure 13, and it runs from the nose bridge and ends by the inion. The odd and even numbers subsequently refer to left or right brain hemisphere, respectively. The zero figures lie by the dividing fissura longitudinalis cerebri. Respective letters advert to certain areas as follows: C for central, FP for frontopolar / pre-frontal, F for frontal, O for occipital, P for parietal, T for temporal, and A for auricle in which no electric activity is recorded.[199]

Figure 12 256-channel EEG cap
Source: Compumedics Neuroscan 2020

Particular electrodes record the voltage and reflect the dissimilarities in values in the waves (Weintraub, Whyte 2018) in sub-millisecond intervals. Overall, basic waves have been gradually identified as alpha (α), beta ($ß$), gamma (γ), delta (δ), theta (θ), kappa (κ), lambda (λ), and SMR (sensorimotor rhythm). Each wave is associated

[198] Cerebral activity neurons produce electric potentials which may be found on the surface from where EEG acquires the data for its recordings (see Paszkiel 2020).
[199] Similarly, no electric activity is recorded on the nose.

with corresponding frequencies and amplitudes which are mirrored in physiological activities (Paszkiel 2020).[200] Elemental features have been summarised in Table 5 in order to highlight the main differences amongst the waves.

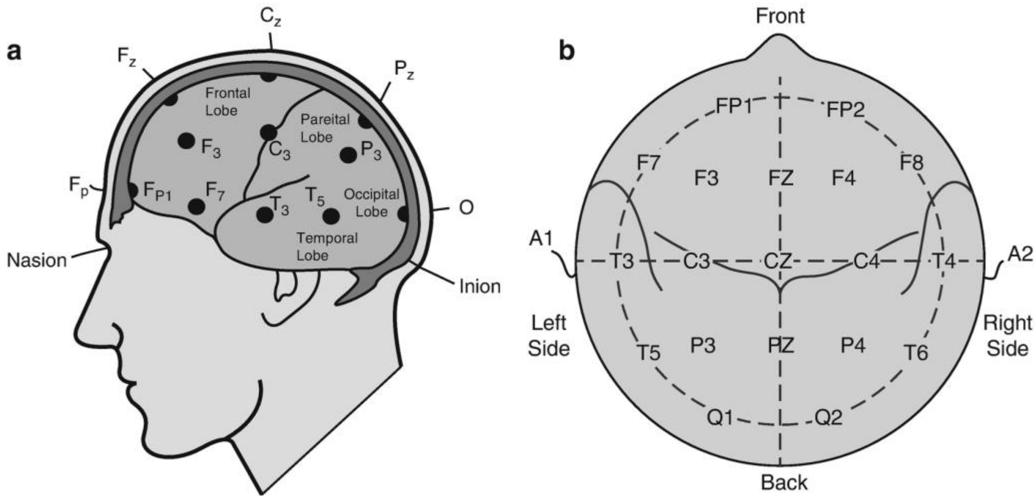

Figure 13 Head and brain coordinates of the International 10-20 system

Source: Whyte 2011, p938

Wave	*Amplitude*	*Frequency*	*Activity*
alpha (α)	5–100 µV	8–12 Hz	When in a resting pace, closed eyes
beta (ß)[201]	2–20 µV	14–30 Hz	Mental activities[202]
gamma (γ)	2–10 µV	30–50 Hz	When awake
delta (δ)	20–200 µV	0.5–4 Hz	Variable presence when asleep
theta (θ)	5–100 µV	5–7 Hz	When awake, emotional arousal or stress
kappa (κ)	5–40 µV	8–12 Hz	Thinking, problems solving
lambda (λ)	20–50 µV	100–300 Hz	When visual stimuli imposed
SMR	~	12–15 Hz	Motor calmness, active mind

Table 5 Brain waves
Source: Based on Paszkiel (2020, pp4–5)

Therefore, this electric activity is recorded at the level of surface which significantly sets EEG apart from fMRI and other tools which record inner depth areas

[200] While the amplitude unit is the microvolt *(µV),* the unit of frequency is calculated in hertz *(Hz).*
[201] The *Mu (µ)* wave is usually associated with the *ß* wave, obtaining ca 7–11 Hz. Albeit not pathological in its core, its presence occurs mostly and is specific for sociopaths.
[202] The *ß*2 wave (22–30 Hz) stands for emotions, such as fear, concerns, and anxieties (ibid).

such as the amygdala, for instance. EEG is not able to do so, and thus its results may be skewed (Whyte 2011). Another approach to EEG usually analyses the event-related potentials (ERP) functioning as reactions of the CNS to given stimuli of manifold characters (see Procházka, Koranda, Korandová 2017, 92–97).

Furthermore, even though the signal of EEG, and therefore the high temporal resolution, is good quality, its spatial resolution remains inaccurate due to the fact that there are many brain regions sending a signal simultaneously (Weintraub, Whyte 2018). There are other physiobiological aspects which may negatively affect the EEG monitoring and must be technically cleared away. These are, for instance, eye movements and blinking or muscle contractions as in case of heart (ibid). In addition, a certain limitation lies in the participant's age because EEG recordings vary in the course of time when delta waves usually become theta waves, and the alpha waves stabilise by the age of 18, thereby influencing the research outcomes (Seidl 2015, p130).

Figure 19 EEG recording in an instance
Source: Frontal Cortex 2007

In defiance of simplicity *(sic)* to analyse the findings, it is definitely harder to attract the public after evincing the recordings of EEG (see Figure 19) because the resultants lack the glamorousness of fMRI.[203] Paradoxically, fMRI is much more

[203] To clarify, while measured and recorded observations are known as electroencephalograms, everything is recorded by electroencephalographs, and the measurement method is known as electroencephalography (EEG).

difficult to interpret as previously demonstrated. This non-invasive method,[204] has been developed via quantitative EEG (QEEG). It is evident that the EEG variables which may be analysed (frequency, amplitude, phase, symmetry) are appraised diachronically or altogether. QEEG's findings are still, however, under scrutiny for its employment (Weintraub, Whyte 2018, p1283). The SWOT analysis then summarises that due to the biased findings in case of the youth, it turns out to be a convenient tool if employed for adults, especially in neuropolitics, since the franchise is set limited only to citizens of 18 years of age (with some exceptions in the world as in Austria, for example). EEG seems to be mostly convenient for neuromarketing practitioners because the tool is able to identify inclinations towards or against inquired campaigning. By analogy, EEG still cannot represent a comprehensive instrument for more complex processes. It primarily focuses on pyramidal cell, ie, the *input and output* (see Taylor 2012, p134).

S	W	O	T
Ability to test cognition and memory coding	Recordings and measurement on the scalp's surface, not deeper though	Feasibility to use the method and its general availability	Disparities in electric conductivity among subjects
Ability to test brand recognition, attention and interest	The youth as a sample may be very questionable	Neuromarketing potential when analysing reactions towards new products and ads	The inquired variable may be located deeper than at the level of brain surface
Connexions to the personality traits	Worsened spatial resolution	In-store /virtual reality experience	Problem to classify the findings
Lower costs and a possible portability, especially in comparison to fMRI and MRI	The findings may tend only to negative or positive reactions from the subjects	Political neuromarketing may use it for slogans, website, leaders' appearance	Neuroethics questioning the possible abuse of mental privacy

Table 6 SWOT analysis for EEG

[204] There is, however, even an invasive version of EEG, known as electrocorticography (ECoG). By contrast, this method needs the scalp to be uncovered and exposed so that the electrodes may be placed right on the surface of the human brain.

4.4 Techniques of electrodiagnosis (EDX)

Even though this chapter is not entitled *"cerebral"*, the introduced methods are indeed connected to the human brain. The only difference, however, dwells in the fact that the tools of this chapter analyse the cerebral activity *indirectly.* Whereas the preceding instruments specialise in the human brain *per se.* The following tools make avail of the findings but also take other physiological traits into consideration. Electrodiagnoses are based on neurophysiological investigations of muscles and nerves and its use is wide, since *"not only [it] can support or confirm clinical diagnosis but suggest the severity or extent of the disorder (…) and may also help exclude other diagnosis and have an important prognostic role in guiding management"* (Lopez 2018, p1281). Electrodiagnostic testing may be abbreviated as EDX, and electromyography (EMG), nerve conduction studies (NCS) and electrodermal activity (EDA) account for the main representatives (Silver 2004).[205]

And regardless of its assets and opportunities which are to be discussed in the following subchapter, EMG and its specified process focusing on face as facial electromyography (fEMG) and EDA are often omitted from social neuroscience and neuromarketing research (cf, Zurawicki 2010, Kable 2011; Kumar, Singh 2015; Alós-Ferrer 2018). Surprisingly, other exacerbating and less practical tools, especially fMRI, have been given preference.

4.4.1 Facial electromyography (fEMG)

Electromyography (EMG) evaluates how the muscle fibre functions,[206] similarly as in case of peripheral nerves, and as Seidl adds (2015, p130), it indirectly *"evaluates spinal*

[205] Silver (2004) notes that the NCS and EMG are usually merged under the EMG acronym because the NCS and EMG are interconnected and both present in clinical conditions.
[206] As in case of EEG and its terminology, recordings of EMG are called electromyograms.

structures and its mutual integration (…) via recording the muscular action potential."[207] Owing to the technological progress in the 1950s and 1960s, meaning in the aftermath of the Second World War and its consequences, the method studying neural conductance and muscles could be developed. The fact is, however, that its history and experience may be marked as very much *"short"* (Binnie et al. 1995, p45) in comparison to other tools.[208]

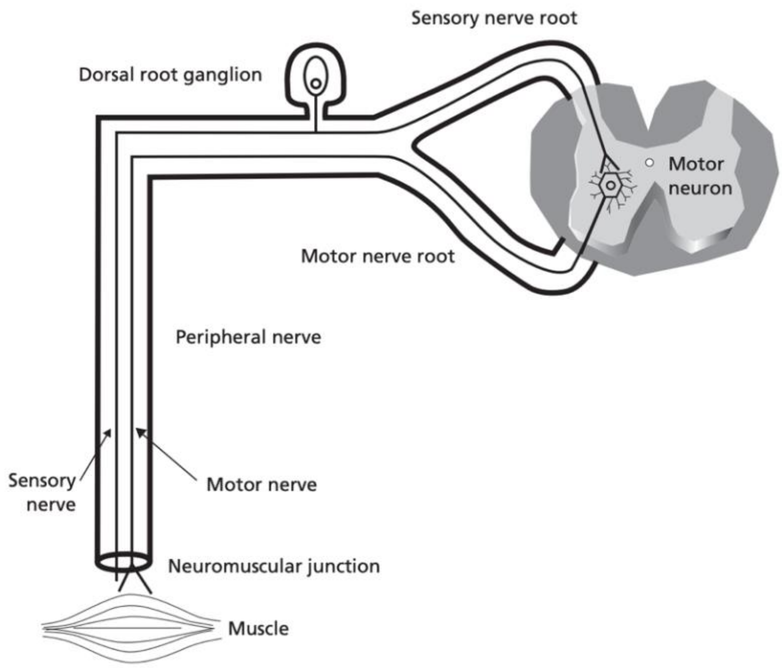

Figure 20 Connexions in the CNS-muscle communication
Source: Silver 2004, p2

EMG and other tools of EDX examine the nervous system, and it aims to identify an occurrence of possible pathology (Silver 2004). Two possible techniques may be recognised, thus making the procedure more or less invasive. Whereas the invasive one uses a needle application into the muscle in order to reach it completely, the other

[207] A detailed analysis on corresponding neurophysiology, in respect of EMG, may be found, for example, in Binnie et al. (1995).
[208] Some pioneering sketches of muscles as components of anatomy may be found in Leonardo da Vinci's work, ie in the beginning of the 16th century. This anatomical knowledge has then been specified and new technologies and even improvements of previously known aspects, such as needles, have enabled the method to rise.

one uses electrodes glued to the muscles instead (Michel 2013). But even the use of needles does not cause any serious ecchymosis, nor harms. Subsequently, both of them investigate the process of muscle activity and its connexion to the CNS. The following Figure 20 exemplifies the main endangered locations in the whole process of neural communication. Overall, it is the spinal cord, brain stem, cerebellum, thalamus, basal ganglion, and the cerebral mantle taking part in and executing movement activities.

Facial electromyography (fEMG) is an advanced subcategory. This technique measures and focuses strictly on facial muscles. More precisely, out of 43 facial muscles as showed in Figure 21, fEMG bears in mind and records two of them because its role and position signify a great relevance (Wilson 2017). These are the *zygomaticus major* and the *corrugator supercilii*. The former, located on participants' cheeks, is associated with positive stances and reactions and is known as the *smiling muscle*. The latter, located on participants' forehead, functions as a reaction indicator towards negatively felt stimuli (see also Larsen, Norris, Cacioppo 2003).

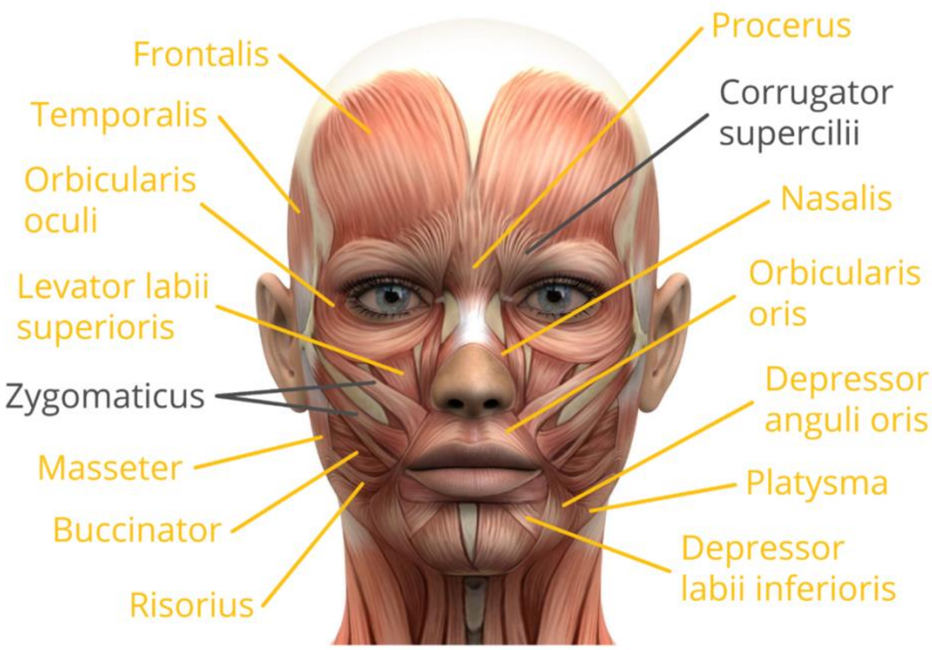

Figure 21 Facial muscles
Source: Wilson 2017

Before any fEMG research, it is necessary to clean and peel the participant's skin on the examined cheek and especially on his or her forehead, since this is the location of a higher incidence of sebum, ie, oily secretion. Afterwards, three electrodes must be glued by a conductive gel. Two of them are regular electrodes,[209] the third one's objective is to ground, when considering the process operates as an EDX experiment.[210] All of them shall be placed on the corrugator supercilii, on the forehead and the next three on the cheek as depicted in Figure 22. The third electrode is meant to earth even on the zygomaticus major, on the cheek, too. The Ag/AgCl or Zn/$ZnSO_4$ electrodes[211] have a bulge in the middle on which measuring terminals are clipped onto.

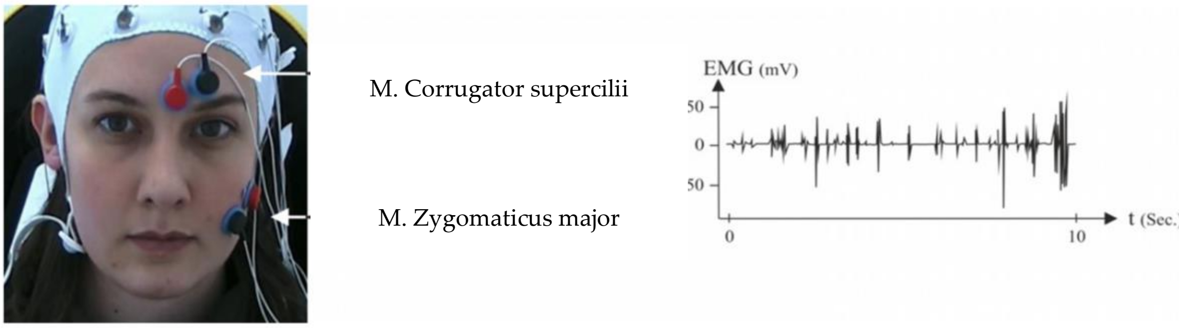

Figure 22 fEMG electrodes with an instance of recording
Source: Rukavina et al. 2016, p8

This connexion routes the acquired signals to the amplifier. In the course of experiment, many muscular efforts or movements may be invisible to the naked eye and the participant may try to conceal the emotional side. Yet fEMG is still able to identify these movements even in a lower scale because, as Michel notes (2013, p43), *"there is no spontaneous activity (…) inasmuch as muscle fibres are usually electrically silent*

[209] In the concrete, those three electrodes are as follows: the reference electrode, recording electrodes, and the grounding electrode.
[210] As in case of other types of research, metal accessories (eg, piercings, necklaces, earing, and bracelets) should be removed in order to protect the participant from a minor electric current which could be produced.
[211] Meaning that these are made of silver chloride or zinc sulphate, also known as white or zinc vitriol.

at rest".[212] In the investigation, researchers may observe and compare the amplitude (ranging between 1–1,000 μV) and the frequency (ranging also between 1–1,000 Hz). All the acquired data must be calculated in absolute values, and therefore, correct interpretations are more reachable than in case of (f)MRI or even EEG because the utmost and/or deviant figures may be statistically processed,[213] and thereby simplifying the measurement and interpretation in response to positive and negative reactions from the participants.

4.4.2 Electrodermal activity (EDA)

The second technique is based on the electrodermal activity (EDA) studies specializing in *"changes in the electrical properties of the skin"* (Greco et al. 2016, p1). Its roots may be observed in the 1849 experiment conducted by Emil He du Bois-Reymond in Germany, when he had asked his participants to put their upper or lower extremities into a solution of zinc sulphate. And it had allowed him to observe the electrical current. His findings, however, were biased by the then wisdom that it had been muscle action potentials which caused the examined effect. A reciprocal connexion dwelling in the sweat glands and electrical current was validated in Switzerland in 1878 (Boucsein 2012, p4). Afterwards, in the course of time, terminological disarrays have led to many modifications and changes in terminology of examined aspects differentiating amongst the skin conductance level (SCL), skin potential level (SPL), skin conductance response (SCR), and skin potential response (SPR) as expected values (cf, eg, Prokasy, Raskin 1973, pp4–7)[214]. By the turn of the 1980s and 1990s, electrodermal activity has become more popular again and new research studies were initiated (Roy et al. 1993).

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[212] Similar to other techniques, participants should be asked to smile and frown then, so that the practitioners can make certain that the electrodes measure and record the data correctly.
[213] Before this process, nevertheless, the recorded data should be filtered and freed from biased figures caused by blinking or the heat beat.
[214] In addition, all of the aforementioned operationalise with diverse units, for instance, mV, μS, and Ω.

In general, given stimuli elicit feelings of stress, and it consequently activates the sympathetic nervous system (SNS), part of the CNS.[215] Afterwards, the eccrine glands react and thus raise the skin conductance level (SCL). Neurobiologically, there are two branches of CNS being in charge of EDA, the ipsilateral and the contralateral one. Whereas the latter employs the contralateral cortex, basal ganglia, frontal, and premotor cortices in order to active cognitive processes, the former is based on the anterior thalamus, hypothalamus, amygdala, and the hippocampus to trigger emotional reactions (see Boucsein 2012, pp22–23).

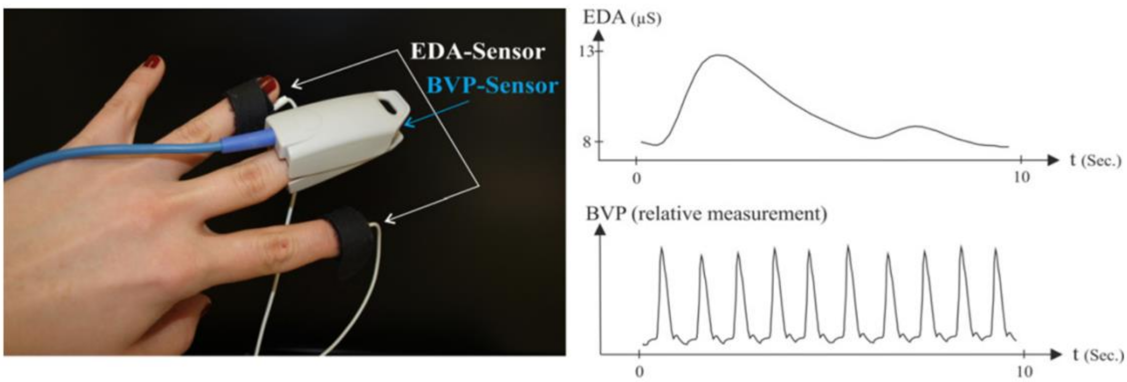

Figure 23 EDA and a BVP recording instance
Source: Rukavina et al., p7

In practice, the most frequent measure of EDA is skin conductance (SC) which may be divided between the SCL, ranging between 2–20 µS, and SCR ranging between 0.05–5 µS (Boucsein 2012; Greco et al. 2016). In comparison with fEMG, for EDA experiments, it is key not to clean the skin and put the glued electrodes right on as illustrated in Figure 23 that also demonstrate the resultant curves.[216] Electrodes are then connected to the respective amplifier.[217] Subsequently, participants should be asked to slowly breathe in and out so that the recordings may be double checked in regard to its correct functioning (Mendes 2009).

[215] CNS as a whole is not taking part in this process though.
[216] It is crucial to use a conductive gel on two recording electrodes.
[217] Research studies may be enriched if the blood volume pulse (BVP) unit is also added to the experiment.

The findings are proved to be useful in many research spheres, such as for instance, emotions evoked by more or less disturbing images, political leaders and political campaigns, or in everyday situations when processing irony (cf, Greco et al. 2016; Thompson et al. 2016), depression analyses and investigations (Frank, Swaine 2018), and finally, in many psychologically oriented studies owing to its correlative connexion to traditional personality traits (Boucsein 2012).

S	W	O	T
Ability to assess positive and negative emotional responses without cognition[218]	Not a direct recording of brain activity, only superficial muscle analyses follow	Feasibility to use the tools, and its general availability too	Disparities in electric conductivity and muscle activity among subjects
Mutual linkages between EDX and personality traits	Narrower scope of themes to consider for analyses	Studies on politically sensitive issues without the need to speak in case of participants	Temperature conditions in the laboratory affecting the findings
EDA shows a merest rise in stress or arousal level[219]	Delays in reactions and thus in data recordings	New spheres of personalised politics and political preferences	Blinking and heartbeat may vitiate the findings
Lower costs, especially in comparison with fMRI, MRI, and EEG	Restricted numbers of electrodes used for recordings	Political neuromarketing may use it for slogans, websites, leader's appearance	Neuroethics questioning the possible abuse of mental privacy
Easier to use and interpret	Problems with muscle accuracy	Decoding public opinions	Habituation

Table 7 SWOT analysis for fEMG and EDA

[218] These basic affirmative or disapproving reactions have been complemented, as noted by Huang, Chen and Chung (2004), when stressing the capability of fEMG to recognise *misery, delight,* or *fatigue.*
[219] For this reason, EDA has been crucial part of the lie detector system.

4.5 Eye tracking

Although eye tracking as a method is not part of EDX, it has become a very favoured tool for research (Brunyé et al. 2019). Horsley (2014, p180) even compared its use and importance to a new shift in paradigms as Kuhn had contemplated in the 1960s with his theory on *Structure of Scientific Revolutions* (see Kuhn 1996).[220] From the very first employments of primitive eyes observations in the 1880s (Lund 2016, p586), the tool has been gradually developed and currently, it may be found in clinical research as well as in marketing and behavioural studies due to its objective to unriddle relational liaisons between cognition and eye movements after imposing particular stimuli. Whilst the method used to be invasive in its beginnings inasmuch as scholars had been touching the participants' corneas, and thus resembling *"medieval torture"* (Bergstrom, Schall 2014, p9) when eyes and its movements had been studied, by the turn of the 20th century, specifically in the USA in 1901,[221] a non-invasive technique was created. Afterwards, its employment peaked in the 1970s (Jacob, Karn 2003, p574) as a consequence of technological progress and new discoveries made on the eye anatomy (Yarbus 1967).[222] Nowadays, the situation is more comfortable, since participants do not need to be harmed and, at the same time, the tool is easier for researchers to apply.

In brief, modern eye tracking studies examine sundry forms and aspects of visual attention in order *"[to] detect where users look at a point in time, how long they look at something, and the path their eyes follow"* (Bergstrom, Schall 2014, p3), as the authors summarised these activities into three main areas of possible research: *location, duration, and movement* (ibid).

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[220] From the very beginning when this book had been issued, Kuhn's theory has been widely criticised and appreciated at the same time (cf, eg, Andersen, Barker, Chen 2006; Devlin, Bokulich 2015; Kindi, Arabatzis 2012; Richards, Daston 2016).

[221] American scholars Raymond Dodge and Thomas Sparks Cline are widely recognised as modern founders of this technique (see Dodge, Cline 1901).

[222] Bergstrom and Schall (2014) noted that these innovations enabled to move the research from clinical conditions and made the research method more accessible, cheaper, and thus usable in the marketing practice.

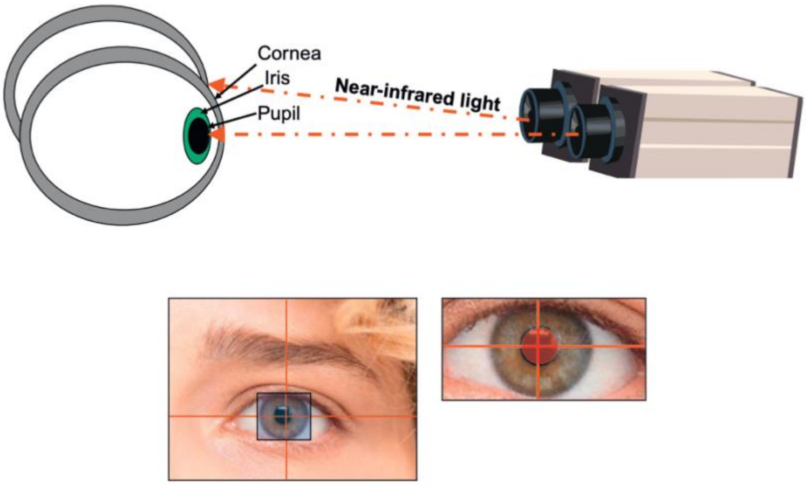

Figure 24 Eye tracking functioning network
Source: Bergstrom, Schall 2014, p4

The basis of eye tracking, as showed in Figure 24, lies infrared cameras that must be pointing straight at participants' pupils, and thereby causing reflexions, so-called pupil-centre corneal reflexion (PCCR) as a basic information carrier (Duchowski 2007; Hartzbech 2020). The PCCR consequently allows researchers to observe the resultants which may be of 10 elemental types: fixation and gaze points, heatmaps, areas of interest, the time of first fixation, time spent, ratio, fixation sequences, revisits, first fixation duration, and average fixation duration (see Farnsworth 2018; Brunyé et al. 2019). Sought after examples of given metrics are depicted in Figure 25. In addition, while in fEMG research, for instance, blinking and eye movements may cause disruptions in recorded waves, in eye tracking, *a contrario*, these activities are associated with contributing to the overall findings.[223]

Altogether, there are three options for eye tracking and its use: Laboratory-based research for which computers with a respective type of software and infrared cameras are salient. This functions as a static variant of measurement. Another one uses specific eye tracking glasses with built-in hardware and therefore, participants may be asked to walk or behave in accordance with given conditions of experiment.

[223] When analysing the variables, the units and data may be very extensive as in case of other previously mentioned tools. Fixation, for example, lasts between 100 to 600 milliseconds when participants are observed for paying attention to certain facets (Bergstrom, Schall 2014, p6).

The third option is based on a virtual reality headset in which the environment may be modelled in advance. The final decision which of these is the most expedient depends on the form of research and financial resources.

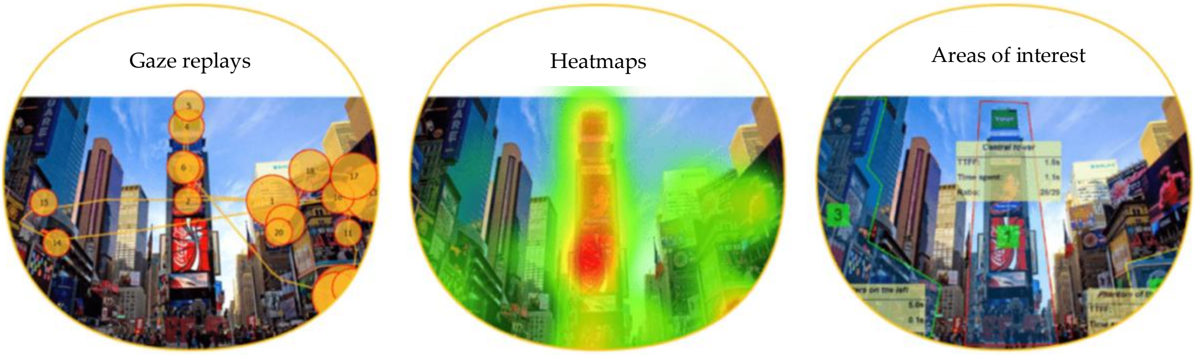

Figure 25 Eye tracking metrics in instances
Source: Hartzbech 2020

Not only in clinical conditions, but eye tracking is being used when researchers examine and treat attention problems, eye defects, phobias, autism and cognition, decision-making and emotions, literacy, advertisements of any kind, be on the Internet, social media or elsewhere (Bergstrom and Schall 2014).[224] Accordingly, Duchowski (2007, pp205–206) divided eye tracking into two categories as *interactive* and *diagnostic* research. Notwithstanding successful studies providing evidence on relations between memory and gaze duration, fixation duration and attention (eg, Guerrerio, Rita, Trigueiros 2015; Zhang, Yuan 2018), there are still first-order problems eye tracking must face. Similarly, as in case of fMRI or EEG, it is the fact that experiments are conducted in laboratories and these cannot substitute the real environment (Scott et al. 2019). On the other hand, mobile options as eye tracking glasses or virtual reality headsets are burdened with a lower infallibility of testing (Xu-Wilson, Zee, Shadmehr 2009; Brunyé et al. 2019). In conclusion, it should be noted that interpretation procedures are not as demanding as for fMRI or EEG analyses.

[224] Thanks to the variability in use, even more complex diseases as Tourette syndrome or Rett syndrome are inquired too.

S	W	O	T
Ability to test recognition, attention and interest	Not a direct recording of brain activity	Feasibility to use the method and study voters' interest and attention	Disparities in electric conductivity among participants
Ability to measure the interval of eyes concentration	Narrower scope of themes to consider for analyses	Neuromarketing potential when analysing reactions towards new products and ads	Head movements vitiating the tracking line
Ability to localise the spots of participants' greatest interest	It cannot measure why the eyes actually focused on given spots	Political neuromarketing may use it for slogans, website, leaders' appearance	Confusing or skipping words while reading implying participants' reading problems
Lower costs and a possible portability, especially in comparison with fMRI, MRI and EEG	Not able to measure and record reactions and feelings	Political communication potential, social media development	Neuroethics questioning the possible abuse of mental privacy
Ability to map the major zones of interest	Eye movements do not reflect any thoughts	In-store /virtual reality experience	Squinting

Table 8 SWOT analysis for eye tracking

4.6 Summarisation

Five aforementioned SWOT analyses exemplified two trajectories of neuropolitical research. Eye-tracking and EDA are suitable for research studies engaging in topical affairs, political campaigning and therefore but not exclusively, instantaneous effects. This is also mirrored in the lower price and lower knowledge demands for its application. Metabolic and electric activity-based research fits the projects seeking to elucidate deeper patterns, which are particular for personality traits and corresponding political and voting behaviour and are rooted in long-term attitudes. In this instance, fMRI and PET are able to deliver substantial data sets. Facial EMG remains on the border of these two routes, but if employed together with EDA, incentive findings may be revealed as well. The fact is, however, that in this type of research, albeit biologically based, the human brain is not examined directly. Finally, one obstacle that has not been discussed in all the SWOT analyses in detail resides in problems associated with the data interpretation which may be, after all, gruelling.

Whilst scholars prefer to focus mostly on fMRI due to its scanning abilities and marketing practitioners tend to overestimate the overall capabilities of eye tracking, electrodermal activity and facial electromyography have proved to possess not only useful abilities in respect of neuropolitical research, but these two tools succeed in accessibility and use itself too (see Larsen, Norris, Cacioppo 2003; ‘t Hart et al. 2018). Notwithstanding some exceptions (eg, Harmon-Jones, Beer 2009), researchers do not pay attention to EDA, nor fEMG sufficiently, though and prioritise more demanding instruments or stick to neuroimaging only (eg, Cohen, Sweet 2011; Carter, Dalley 2012). The determinative factor lies in the complete character of research practitioner’s aim to engage in, and therefore, the propounded SWOT analyses shall initially direct projects in the right trajectory in accordance with examined variables.

5 QUESTIONING NEUROETHICS[225]

If the 20th century may be perceived as the period of genetics, then the contemporary 21st century, as the *"neurocentury"* (Farah 2011), is most definitely the century of neuroscience (see Moreno 2003; Conrad, De Vries 2011). And inasmuch as modern technologies have been significantly on the upgrade in the first decade of this century, scholars of ethics and bioethics were given new materials, data and eventualities to examine (Leefmann, Levallois, Hildt 2016). Bioethicists, however, still do find neuroethics *a priori* superfluous and worthless (Conrad, De Vries 2011).

Therefore, this chapter summarises the most striking approaches and attitudes regarding neuromarketing and its corresponding cardinal neuroethical queries that are frequently discussed. Bearing in mind the complexity of neuroethics as a field of research, the text deals with marketing and neuromarketing as two analogous stances and then ethics and neuroethics is analysed accordingly while using particular instances in order to ask corresponding (neuro)ethical questions. Whereas the introductory sections examine necessary components specifically indispensable for neuroscientific practice, the following part focuses on respective philosophical reasoning on ethical matters in marketing, medical environment, and neuromarketing as such. Afterwards, there are neuroethical issues to be addressed. The chapter encapsulates sundry approaches to neuroethics, and in the aftermath, possibilities of further research will be stated. However, marketing, in its elemental theoretical concepts, as formed by economists, are to be excluded from this chapter to avoid repetitive inferences without any satisfactory foci on neuroethical aspects. Since neuromarketing, having certainly problematic relations with (neuro)ethical questions by definition, has been comprehended as ambiguous, the text addresses both the stances, be it affirmative or negative with respect to the applicability, functionality, and the *raison d'être* of neuromarketing and neuroethics. Overall, as concluded, there

[225] This section on neuroethics has been issued as a separate chapter as Petlach (2020) in *Analysing the strategic role of neuromarketing and consumer neuroscience,* a book edited by D Atli.

are key issues to be studied at first, and only further improvements in neuroscience may affect the future directions of neuroethics. Owing to the instant questioning of elemental definitions (Roskies 2006), practice procedures, and the mission itself, it is understandable that neuroethics struggles with clarifying in which trajectory it should lead; meaning that it has not been entrenched in the system of academic disciplines. Given the critical appraisals and observations scholars have offered, this chapter's objective is to advert to the route neuroethics shall set out for. Furthermore, the aim is to identify the roles neuroethics should play in order to be finally acknowledged after years of being lost in the fog of void and empty definitions. Finally, the code of ethics, as issued especially but not only by the *Neuromarketing Science & Business Association* (NMSBA), will be recalled and complemented by additional recommendations and suggestions for neuromarketing practitioners so that their future research projects will be suitable and correct on the ethical level, and thus, widely acceptable by all the involved parties.

However, before further debates, there are terms that need to be at least briefly explicated in respect of its meanings in order to avoid any disarray. First and foremost, *ethics per se* functions as a theory of morals. It defines and arbitrates what is or is not moral or immoral, right or wrong, good or bad, true or false and so forth. In the course of time, there have been many changes in understanding of the content of morals and principles which should have been universal. Originally, Cicero had translated the term morals from the Greek word *ēthikós* to Latin. And overall, ethics shall be understood as a *"critical reflexion of morals"* (Vácha 2012a, p17). Secondly, as Haškovcová (2015, p15) specifies, *bioethics* is a hypernym for [not only medical] ethics because its aim is to interpret ethical problems and situations not merely in medical surroundings, but within the respective research areas covering all the living creatures and nature. It means that the outputs of bioethics apply to pharmacy, chemistry, biophysics, and even ecology, for instance. Regardless of this terminology, moral principles and codes must always be in line with the legislation and legal code of each country.

5.2 Neuro-x fields and respective facets

Neuroscience endeavours to investigate brain processes leading to diverse brain activities which result in particular behaviour patterns, be it good or evil (cf, Greene 2013; Sapolsky 2017; Milgram 1974; Zimbardo 2008). Progressively, neuroscience has exhibited a certain level of positive opportunities (Morein-Zamir, Sahakian 2010), and then many thrilled scholars and marketing experts have embraced this discipline across the world in order to enhance their campaign strategies and the ultimate impact on consumers. For this reason, there are currently brand-new and voguish neuro-x fields, as for instance, neurolaw, neurotheology, neuroeconomics, neuroeducation, neuropolitics, and neuromarketing (Racine, Dubljević 2016). Nowadays, however, the use of neuroscience has led to many pressing queries *"(…) challenging our understanding of human behaviour"* (Farah, 2004). And neuromarketing declares to know the answers to many questions previously posed and asked by marketing pundits (Illes & Bird 2006). Consequently, a gradual increase of neuromarketing can be observed among many traditional and well-known companies such as *Disney, Ebay, Google, Hyundai, PayPal,* and *Microsoft* because even marketing and PR specialists took the opportunity to link marketing research and economics to neuroscience to make sure that their products succeed easily and dominantly (cf, eg, Farah 2011; Hensel, Wolter, Znanewitz 2017). The problem is, though, as claimed by Zhixing (2019), that neuromarketing and neuroscientific research usually stand on the verge of the ethical and unethical course of action. In defiance of difficulties caused by interpretations of results in neuroscience, neuroethics cannot be simply embodied into a metronome principle which would be stating that something is or is not ethically appropriate. From a philosophical perspective, there are many questions that cannot be answered in one word either.

Marketing and neuromarketing appear in diverse forms and therefore, ethical challenges vary accordingly in a juxtaposition. It was just a matter of time so that a new type of science could have been developed to study and analyse the human brain properly since there has been a significant excitement because the human brain still remains entangled with mystery (Moreno 2003). Neuroscience has complemented and partly substituted the interest and role of genetics in research inasmuch as neuroscience's purport is to analyse human biological backgrounds (Farah 2012).

The tools of neuroscience are based on the level of technical employment; and so, one may differentiate between instruments of technological versus social science and psychological character. Additionally, statistical processing complements the other two. All of these phases as they are utilised may be overlapping and supplementing one another. Overall, as it aforesaid, out of the tools, it is necessary to emphasise that in neuromarketing, mostly three instruments are used: EEG, fMRI, and eye-tracking. And hence, even these three most frequent instruments may be biased and represent a problematic aspect. Whilst social science and marketing strategy research are based on questionnaires, focus groups and interviews, and experiments during which participants are given an opportunity to lie in accordance with his or her preference of free will, in neuroscience, there is only very limited, if any, room for lies from the participants. Moreover, there are even other obstacles. These tools are not designed to be moved, especially in case of fMRI. And it means that everyday reality cannot be sufficiently modelled and reached. Even in case of portable devices, such as the EEG and partly eye-tracking, there are concurrent effects to be placed, albeit in a slight form (Farah, 2005). Moreover, taking part in any fMRI research does not leave the examined participant in a comfortable situation because his or her position must remain still, for instance. Nevertheless, an increase of articles and studies employing the fMRI scanning was unquestionable in the period from 1991 to 2005, specifically from 0 to approximately 1,600 papers (Illes 2007). As it was demonstrated, the vast range of tools also signifies a myriad of ethical queries, and each tool may vary in its consequences and for that reason, before every research project commences, researchers and marketers are expected to consider the ethical side as outlined in this chapter.

5.3 Origins of ethical reconsiderations

Modern roots of bioethics possess its origins in 1927 when Fritz Jahr published his text, *Bioethik: Eine Umschau über die ethischen Beziehungen des Menschen zu Tier und Pflanze*, presupposing mutual relations among animals, humans, and the vegetative kingdom (Conrad, De Vries 2011). In brief, there are many requisites delineating ethics as such to investigate the morals, but overall, three types of ethics are to be recognised. The first-order moral questions are summed by the criteria delivered by normative ethics. Second-order issues are addressed by metaethics, these are, for instance, the moral objectivity or moral epistemology. Finally, very particular themes, as of environmental or neuroscience character, are analysed by applied ethics. By contrast, there are two most frequent motifs in neuroethics: free will and Immanuel Kant's categorical imperative. Free will as part of determinism may be dated back to the Greeks in antiquity (Moreno, 2003). And since there are two orientations of responsibility in ethics, moral and legal (Glannon 2006), only the former, as the categorical imperative, may affect the incentive to act *(Bestimmungsgrund)* afterwards (Falduto 2014).[226]

Leung (2013) identifies three principles of ethics that are to be used regardless of the research theme. It is the *"primum non nocere"* that highlights the possibility of incidental findings and how to handle this situation. According to this rule, people should be informed about potential incidental findings during conducted experiments. In that text, however, the author did not consider free will adequately. What if a participant were against this rule and did not wish to know and thus be informed about the incidence under no circumstances? Secondly, there is the principle to *"help and rescue"* demonstrated, among others, in the Hippocratic oath. And finally, *"mutual benefit"* shall be minimal, meaning that the researcher is expected to protect the examined participant only during the course of experiment. These three principles

[226] Kant's contribution has been analysed for centuries and his notes on autonomy of human beings are highly regarded even nowadays (see Tesluk, Illes, Matthews 2017).

may become contradictory if neuroscience is employed. Even the concept of free will tends to be eclipsed as in case of Everts (2007), after claiming that [free will] is only *"illusory"*.

If ethics were meant to reside in two aspects of research, *empirical*, meaning descriptive, and *consequentially deontological* so that new defining criteria may state universal morals (Petrů 2005), the role of neuroethics, in its minimalist form, must be conditioned by two features too: *normativity* and the *a posteriori* analysis. As a result of the medical scandals in the 1960s, modern ethics has experienced approximately forty years of existence, even though some basic forms of ethics have always been assumed since medicine's transformation and development from the 5th century BCE (Conrad, De Vries 2011). Regarding the legal aspect, there is an increase of legal measures in order to take into consideration specific local conventions (Kulynych 2002; Leung 2013).

The striking point as an initial problem, however, may be found at the universities and colleges wherein social neuroscience or neuro-x field are currently emerging. The problematic facet resides in the level of inexperienced practice. Many of social science-based institutions are not fully prepared (see Chiao et al. 2013), nor used to having independent *Institutional Review Boards* (IRB) specifically for their research projects.[227] Although there are usually commissions for ethical affairs within these institutions, the problem is that they may be found only on the top, meaning university, level and it implies that these commissions are responsible for the university as a whole, but this is not sufficient since IRB should have been formed even on the lower levels. The situation differs in case of private research centres and neuromarketing companies. This group of organizations is expected to follow and

[227] IRB represents a crucial body within the administrative structure of every research centre and university. To all intents and purposes, IRB is meant to protect the rights, privacy, and the common weal of participants (subjects) who participate in any experiment taking place at the institution. According to Oregon State University, there are four cardinal roles of IRB: *"to approve, disapprove, monitor, and require changes"* in the research (OSU 2019).

adhere to a widely accepted set of rules, known as codes of ethics, especially in order to draw attention to its own quality and harmlessness.

5.4 The (un)clear role of neuroethics

What does neuroethics as a term stand for? To parse, *neuro-* as a prefix signifies that this area is linked to the central nervous system (CNS), and *psyche* which signifies that it should be analysed via the tools of neuroscience. The second part of the word originates in the Greek word *ethos*, meaning a sort of character in possession of oneself while defining community values and morals (Petrů 2005).[228] Initial reasons for this interconnexion rooted in the juncture between psychology and neuroscience (Farah 2005), whereas from the 1980s and the early PET utilization, first attempts of cognitive neuroimaging appeared. The interest escalated in the 20th century thanks to the possibility to apply individual imagining in order to deeply investigate the mental state. Before this era, similar types of research were met predominantly with hostility (Evers 2005; Farah 2012). A universally accepted definition specifies that neuroscience is supposed to examine ethical, legal, and social (ELS) ramifications. These three areas have been, however, addressed mostly separately (Illes, Kirschen, Gabrieli 2003). There are two more issues to bear in mind. First and despite a very own inner importance, the general public is usually excluded and not instructed in this area (Farah 2011; Sahakian, Morein-Zamir 2009). Furthermore, even in the academic milieu, university courses are lacking in attention dedicated to neuroethical themes as previously mentioned,[229] notwithstanding the specialization of university courses in neuroscience (Morein-Zamir, Sahakian 2010).

[228] Originally, the word ethos and its Greek perception used to be associated with an area of grazing and for this reason, the discipline that focuses on behaviour of animals is known as ethology (Vácha 2012a, p17)
[229] The authors claimed that less than 8 out of 20 university and research institutions have delivered neuroethical classes in the United Kingdom (Morein-Zamir, Sahakian 2010).

Nevertheless, the overall definition purely claims that neuroethics examines *"consequences for the individual and society"* (Farah 2004).

Two prominent scientists are known for taking part in the inception of neuroethics. It is Martha J. Farah who has been associated with the beginnings of neuroethics thanks to her innovative standpoints (Conrad, De Vries 2011). Another scholar to be highlighted is Judy Illes who has focused on this sphere of research from a clinical perspective. The professional roots of neuroethics may be dated to 2002 when a conference of the same name took place in San Francisco, USA. Its aim was to merge scholars out of dissimilar research disciplines (eg, philosophy, law, biology and medicine, and psychology) to eventually delineate fundamental issues and aspects which should have been taken into account for this highly needed sphere of interdisciplinary research (Leefmann, Levallois, Hildt 2016).[230] Four crucial output domains of neuroethics were identified at this conference as summarised by Illes and Bird (2006) in the following Figure 26.

i, Consequences for understating of the self and responsibility

ii, Social policy in respect of socially relevant topics

iii, Clinical practice specializing in therapeutic activities

iv, Public engagement and education

Figure 26 Domains of neuroethics
Source: Illes, Bird 2006, p514

[230] William Safire is associated with the opening explanation that neuroethics should define the good and the bad at the same time (Farah, 2012; Müller, Jox 2017).

Having said that, traditional ethical queries, as studied and appraised by bioethics, have been modified and, in some cases, rigorously intensified in urgency (Farah 2010). Previously, the total of three rudimentary roles of neuroethics could have been found. These had been formed in accordance with the topics it used to characterise. The first one had studied children and their rearing in a general sense, the following one was dedicated to technological advances, and finally, the third one was based on ethical considerations of human behaviour traits (Illes, Bird 2006). Among the most common and relevant instances of neuroethics, it is neuroenhancement,[231] responsibility, and brain imaging that are predominant topics (cf, eg, Chatterjee, Farah 2013; Farah 2012). Geographically, Canada and the USA both play first fiddle as the local scholars have been studying corresponding aspects in a varied incidence from the early 1970s (Müller, Jox 2017). As exemplified by Olteanu (2015) in Figure 27, it was particularly the second half of the 2010s, with the peaks in 2009 and in 2013 respectively, that has drawn attention to neuroethics significantly, slowly being accompanied by neuromarketing studies as well.

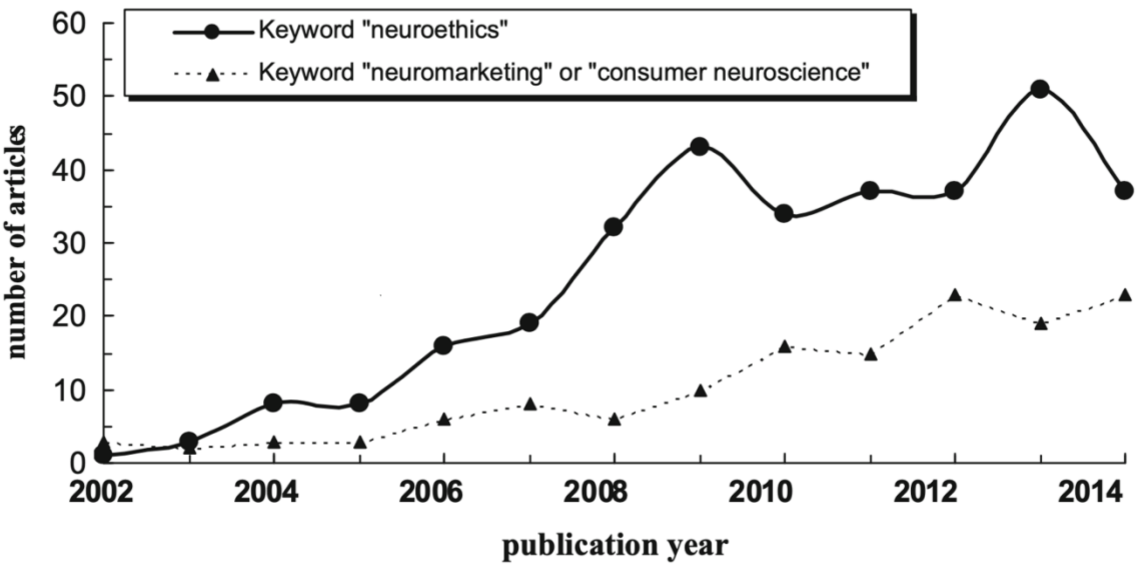

Figure 27 Neuroethics in academic papers
Source: Olteanu 2015, p194

[231] Neuroenhancement implies the use of any type of enhancement and its further consequences and ethical appropriateness. Hall (2017) presented an instance of its use in and connexion to politics.

Originally though, preliminary attempts to conduct experiments in ethics appeared in the late 1960s. It was Philippa Foot and her proverbial *"trolley problem"* which has been subsequently elaborated on (cf, Thomson 1986) into two analogous examples when the *"footbridge"* situation was added. The purport is to test participants' reactions in accordance with ethical and moral principles. In the first experiment, there is an unstoppable trolley which is on the way to kill five people walking in the track. The only chance to stop the trolley is if using a lever so that the trolley is redeployed to a different track in which direction, however, one person would be killed anyway. What is to be done? What is the *right* thing to do? Responders as participants may decide whether to act, and thus use the lever, and kill one person knowingly instead of having five dead people. Contrariwise, participants may not act and therefore, they would not kill that one person intentionally, but five other people would be hit and killed consequentially. The second example uses an unstoppable vehicle too. In this situation, participants are expected to decide whether to push a fat man off the footbridge in order to stop the vehicle and save five people in the track. Nevertheless, this deed would mean a caused killing of the fat man. The second option is not to intervene but having five other people killed. Again, could a participant select any better variant? There are no correct or wrong answers in these two tests. Yet participants neither act, nor perceive these two situations as if under the same circumstances, but quite the opposite.

In 2001, these dilemmas were worked up into an fMRI study (Greene et al. 2001), and it concluded that in the footbridge situation, brain activity took place in the medial frontal gyrus, posterior cingulate gyrus, and bilateral superior temporal sulcus. These areas are connected to emotional responses, and it signifies *"personal"* dilemmas. By contrast, in the *"trolley"* experiment, dorsolateral prefrontal and parietal areas were activated, and thus implying rather *"impersonal"* dilemmas (Gold, Roskies 2008). Discovered and verified dissimilarities resulted in the furtherance of deliberations between the Humean and Kantian devotees who dwell on the presence of emotion and reason in moral judgements (ibid). Accordingly, three neuroethicist approaches and corresponding scholars may be classified. The technology-driven approach that has been represented by Martha J. Farah, the healthcare-oriented approach is symbolised by Judy Illes and Eric Racine, and finally the knowledge-driven approach is linked to Adina Roskies. On top of that, the paper even elaborated on the original fields these scholars are coming from, and it was concluded that a vast majority of experts has been based in psychiatry and neuroimaging, whereas social and economic studies were underrepresented as figured out from their academic outputs (Leefmann, Levallois, Hildt 2016).

Negative attitudes have been observed from the very beginning with three significant arguments opposing neuroethics as a whole. At first, neuroethics would have reduplicated the findings of traditional bioethics. Second, the promises of neuroscience lack in feasibility as in case of neuroethics, and finally, new sets of rules would come in vain (Parens, Johnston 2007). Therefore, neuroethics has been appraised as a field, rather than a *"developing scientific discipline"* (Leefmann, Levallois, Hildt 2016). The causes are straightforward since the methods, approaches, and the role within neuroscience and toward other scientific disciplines lack of coherent definition or rigorous delineation (Northoff 2010). For this reason, neuroethics may be perceived merely as an *"innovative approach"* instead (Levy 2011). Another form of criticism denying any innovativeness claims that neuroethics only mirrors scholars' personal stances (Knoppers 2005). Moreno (2003), on the other hand, perceived changes only in updated analytical procedures. Similarly, as in case of social sciences and humanities, there are terms with no transparent and agreed definitions. Furthermore, neuroethics does not seem to be limited in boundaries of what to target on (Knoppers 2005). On that account, debates on neuroethics are not able to concentrate on deeper aspects and they remain superficial in many cases. Notwithstanding obvious exceptions, scholars mostly summarise and quote aberrant definitions in order to contrast the dissimilarity in technicalities. However, there is not sufficiently enough room to develop the field and demarcate the borders so that the field might become internationally recognised.

As a consequence of these disputes, neuroethics was divided by Roskies (2002) into two categories. Firstly, as *ethics of neuroscience*. This area dissects the steps of neuroscientific research design and the ELS consequences and therefore, a certain similarity with bioethics may be observed. The second category, *neuroscience of ethics*, examines aspects of free will, identity, mental privacy and so forth. And so reversely, the latter expands on the perspective of neuroscience when studying the brain activities and functioning. On a similar basis, Northoff (2010) delineated empirical and theoretical neuroethics to deal with distinct parts of research so that he could decline the dual terminology as proposed by Roskies. By contrast, Macdonald exemplified two categories in which neuroethics is to be analysed. First, there are objects that can be literally executed (ie, modern tools of neuroscience and its discoveries) versus the things that are known and comprehended (ie, neuroanatomy and corresponding ethical matters) as summarised by Olteanu (2015). Furthermore, bearing in mind only two groups of challenges, when researching neuroethics, would not be sufficient because scientific and socio-cultural aspects are not of complete and adequate qualities. And it foregrounds that philosophy should be included as well (Evers 2005), be it in its traditional sense or as so-called neurophilosophy.

A parallel problem is, however, that the results obtained by neuroscience are being accepted uncritically and people tend to believe the given information a bit more (Illes, Bird 2006), and it is disputable for several reasons. First and foremost, using EEG and fMRI may be challenging even for trained pundits and moreover, the interpretation itself is very knotty. It is not astonishing that even statistical processing may become an obstacle if variables are mistaken or even reversed. The outcome may work otherwise than previously predicted (Lieberman, Long 2018). Furthermore, for the human brain, as it reacts and acts in accordance with the stimuli, enhancement, drugs, surgeries and/or injuries, there are only two fundamental phases in its activity that are being distinguished: *"alive or dead"* (Farah 2005). It means that apart from all the attempts to investigate the brain thoroughly, it will still remain unpredictable for decades. It is questionable, though, whether it may ever be decoded as a structure. As

Farah (2012) then wittily emphasised, neuroethical issues are of this twofold character: *"damned if you do and damned if you do not"* (Farah 2012). Resources are the aspect to supplement and bound the aforementioned. As noted by Kulynych (2002), the financial side impacts on the ethical conclusions. Neuroscience with its tools represents a costly sphere of science many universities are not able to afford, and, on that account, research projects are frequently supported with finances from private companies. Therefore, in many cases, the final observations may or may not be biased or at least questionable and thus burdened with conflicts of interest. In order to save money, analysed samples of participants are usually university attenders which may also be disputable after all (see Kittel, Luhan, Morton 2012, p4). Brain-reading may be applied in two forms, lie-detectors and neuromarketing. Whereas the former may be seen as a chance for new accuracy improvements in neurolaw, the latter wishes to forecast what consumers' behaviour is to look like, thus products can be designed accordingly (Haynes 2011). There are two classes of the greatest concern in neuroethics of neuromarketing: vulnerable parties and unprotected consumers (Murphy, Illes, Reiner 2008). Moreover, neuromarketing, neuroenhancement, and mental privacy represent the trinity that has been all the rage for neuroethical research in the past years (International Neuroethics Society 2017). By all means, neuromarketing possesses own critical renditions for neuroethics. There are certain advantages and disadvantages to be taken into account. Whilst regular marketing research inclines to be biased by lies from examined participants, neuromarketing as such is not fully implemented and in addition, there has not been much discovered yet (Farah 2011). And so, there are issues of neuroethics that should have been pondered upon when using neuromarketing.

Right at the beginning, customers are driven to lose anyway in the whole process, be it from the financial or even health side, especially if only greater companies are able to afford neuromarketing. Subsequently, in comparison to sociological surveys, it is not possible for participants to lie and therefore, to express and employ their free will. In addition, in the meantime of neuromarketing experiment, it is questionable how to deal with incidental findings (see Parker, Kienholz 2016). If there are unusual or clear instances of tumour or other perilous components observed, should there be the same logic as in the medical or university research to inform the participants or relatives? How far is it allowed to proceed then if no code of ethics or IRB had previously been installed? Who is responsible for the process of research and what about the final findings and data storage? Are they to be private for good if paid by the company itself or should it be put under scrutiny of peer-reviewed journals so that the universal knowledge may be spread easily and become transparent after all (see also Gruber 2019)? Would the sense of common good be put in practice if a ground-breaking discovery were made? Is the responsibility only upon each human being and thus mental privacy is to be decided by everyone separately if willing to take part in a neuromarketing research project? And finally, when considering mental privacy, there are small-sized samples in neuroscience in comparison with sociological surveys, but are these small samples considerable for mental privacy? In other words, is it acceptable for society if mental privacy is disrupted in case of three people in order to know more about the human brain or its treatment? Who is to decide and state the red lines? How applicable is Kant's categorical imperative on using people as a means while applying neuromarketing for the UNICEF charity advertisement versus mostly unhealthy food producing companies or internet tycoons? Does it mean that consumers are to be influenced and manipulated significantly with their free will in the name of consequentialism? Is the apparent consumerism in line with human rights and free will to possess a new product for oneself or no justice is to be exercised? And therefore, there is a spiral of reciprocally adjacent queries neuromarketing and neuroethics will have to face.

More importantly, regardless of positive or negative attitudes toward neuromarketing, scholars of neuroethics shall abandon facile visions that neuromarketing is to be conducted only ethically if researchers follow basic principles. It is vital to bear in mind the existing difference between the university and business research procedures (cf, Sebastian 2014). While universities are usually but not necessarily supposed to adhere to ethical commissions and IRB, non-academic institutions dedicated to neuromarketing are expected to follow the NMSBA's code of ethics. The fact is, however, that private organizations may decline these widely accepted rules even though this decision could jeopardise the company's credibility.

As aptly summarised by Haynes (2011) in this matter, neuroethics must be able to deal with three elemental aspects: accuracy, validity, and reliability of which all, in simple terms, signify substantial impediments. Children as a specific group represent a separate aspect of this story of ethics as well since using them as a research sample is precarious twice more than in case of adults. Affirmative stances, however, were claimed by Matthews (2015), for instance, who has theorised that neuromarketing did not represent any ethical perils and proved to be successful. His hypotheses were supported by his suggestion to differentiate between *neuromarketers* and *neuroadvertisers*. Matthews admitted a possibility that only the latter is on the verge of ethical problems because their goal is not to design a product, but rather to disseminate manipulation and influence the public. Nevertheless, this draft is dubious and naïve at the same time. Apart from the fact that deciding where the red line could be set in order to distinguish between these two sorts of practitioners remains unfeasible, it is also inescapable to realise that marketing, be it neuroscience-based or not, will always be aiming at having the final say and thus influencing the consumers over and over. And so, proposals on making customers thrilled and satisfied, as expected by utilitarianism, are untenable. For neuromarketing, Ruanguttamanun (2014) even predicted that deeper exposures of brain activities may be fatal and result in the state of *"overconsumption"* invading mental privacy of a great majority of people. Despite the media coverage exhibiting a higher rate of interest which is on the average of 39%, neuroscience tends to keep itself isolated, and regardless of an increase in studies on neuroethics, this whole process still lags behind (Garnett, Whitele, Piwowar, Rasmussen, Illes 2011). The myths about the power of neuromarketing have endured. Not only it will be demanding to disprove them, but the public will need to be educated specifically in this area as previously stated by Illes and Bird (2006) because neuroscience and the brain studies have been omnipresent in the last decade, and its leverage could even be increased and intensified.

5.4.1 Codes of medical bioethics

Medical ethics, also known as bioethics, as previously explained, and its origins cannot be *sensu stricto* dated in history (Haškovcová 2015, p43). In separate countries, the development, research tendencies and conclusions have differed and thus the evolution progress was *"mostly asynchronous"* (ibid). In general, though, ethics has been persistent in research studies for more centuries thanks to philosophy and theology. As noted by Šimek (2015, p9), both of these disciplines reckon that reason is or will have been able to *"solve the problematic issues of morals"*. However, two opening problems must be mentioned. First, (bio)ethical standards and morals have transformed significantly in the course of time (Beauchamp, Childress 2013). And secondly, if one wants to judge and decide over a situation in respect of bioethical principles, this person should be educated and trained in a vast range of disciplines, such as medicine, molecular biology, embryology, evolution biology, economy, law, and sociology, for instance (Vácha 2012a). And an underlying aspect emerges then. Even though famous philosophers as Plato, Aristotle, and Immanuel Kant had pondered upon many fundamental questions of ethics, there are many new issues that are yet to be analysed, such as genetic modifications and human cloning.[232]

Ethics as a discipline has been discussed frequently since the 1960s and even these rather simple rules, and medical practice had been worked up into the *European Charter of Medical Ethics*.[233] This document was adopted in Cos, Greece, in 2011, and it elaborated on the four mentioned rules too. Overall, 15 leading principles adjusting

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[232] Vácha (2012a, p22) clarified the necessity of both descriptive and normative ethics. While the former describes and unify all the available sources on the issue, the latter adds personal statements to the debate.

[233] The unabridged version of the *European Charter of Medical Ethics* is available here: http://www.ceom-ecmo.eu/sites/default/files/documents/en-european_medical_ethics_charter-adopted_in_kos.pdf.

and particularising relations between patients and physicians were approved at the level of the European Union. Each country then also possesses a very own system of ethical codes,[234] among which, there is one being in use regardless of locations, and it is the *Hippocratic Oath*, originally originating in the 5th century BCE, and yet causing many disputes over even currently dividing topics, such as abortions, integrity or drugs (Haškovcová 2015, Miles 2003). Owing to more than one alternative of understanding the text of the Hippocratic Oath, it is necessary to consider the context of examined issue. Nevertheless, from the 1960s, one may observe that this Oath has been modified slightly, and it had been reconsidered especially in respect of the Second World War and all the atrocities committed by the Nazi regime.[235] Four rudimentary moral principles of bioethics that had been identified by Beauchamp and Childress (2013) in their influential book:

i, Autonomy

This prescript bears in mind the importance of freedom and human rights, and patients' sovereignty shall be respected, meaning that they should be told about their state of health as they wish and subsequently, they should be allowed to decide over their future independently as long as possible and as much their knowledge of the medical issue allows.

ii, Non maleficence

No patient may ever come to harm intentionally. There are several eventualities causing harm and they should be avoided respectively. First, patients should not be harmed physically, nor mentally. Secondly, the data obtained whilst examining the patients will be treated in a strict mode, and therefore the data will not be given at anyone's disposal.

[234] In the Czech Republic, for example, there are many other ethical codes: *The Ethical Code of Czech Medical Chamber, The Ethical Code of Czech Dental Chamber, The Ethical Code of Nurses and Hospital Attendances, The Ethical Code of Medical Staff in Non-Medical Fields, The Charter of Medical Staff, Ethical Codes on Patients' rights, and Organization for Protection of Patients in the Czech Republic.*

[235] Therefore, the *Declaration of Geneva* was signed and adopted by the *World Medical Association* in 1948 in order to emphasise the relation between patients and physicians should have been based on *"humane objectives of medicine"* (Haškovcová 2015, p57)

iii, Beneficence

Every medical step shall lead to the good the patients only.

iv, Justice

Two overlapping legal levels play a role in this aspect. Firstly, it is the legal status and anchoring of medicine and bioethics in legal codes, and secondly, it is the accessibility to health care and corresponding equality when being treated.

5.4.2 Codes of neuroethics

For neuro-x fields and neuroethics, there are similarities being used as in case of bioethics. Neuroethics, however, has its own specificities too. There are three periods to which every neuromarketing research project should adhere to. Firstly, there are necessary steps and rules to be observed before the experimental investigation can be actually conducted. Secondly, it is in the course of experiment when the participants are temporarily involved, and thirdly, when analysing, interpreting, and preserving the data and research findings. Concluding deliberations should take place then. Afterwards, the circle can be completed and repeated. At the same time, there are four key parties engaged in neuromarketing research, be it directly or indirectly. They all shall be thoroughly considered when preparing a project, and these are as follows: the ordering party, research institutions that conduct the experimental study, examined research samples (ie, the participants who undergo the investigation), and society that is about to face the imposed product, advertisement or commercial (Hensel, Iorga, Wolter, Znanewitz 2017; Clark 2017). And neuromarketing practitioners then bear full responsibility for given groups of people.

Overall, the author identifies three fundamental types of neuromarketing projects regarding the ethical consequences. *Positive neuromarketing* research is based on public service advertising. In this case, the aim is to help the public when vital steps must be taken in health issues or for charity donations. *Negative neuromarketing* of which employment should, sooner or later, be reconsidered. There are two spheres in which negative neuromarketing poses a significant threat and within these, meticulous steps are indispensable from the side of practitioners. First, in case of health and its possible harm. There are studies showing how obese customers react differently to many products and consequently, they may be influenced easily to spend more money or even keep their unhealthy lifestyle. Similarly, convincing and influencing consumers to buy and consume tobacco products or alcoholic beverages cannot be in accord with neuroethical principles. Even the pharmaceutical industry represents a questionable area. Secondly, and equally crucial, it is the sphere of political neuromarketing campaigning. In this sense, politicians and political parties are treated as products which are to be offered and sold accordingly. Political neuromarketing does not use only the tools of neuroscience. Even shallow methods inquiring the colour preference, face angle or skin tones have already been successfully used. In case of neuroscience, the eventuality of violating free will is even more persistent and hazardous. Moreover, one political figure or party could seizure control if the societal voting or behaviour pattern were predictable. This political issue is inherently connected to the gun industry, and it is ethically doubtful, too (cf, Clark 2017; Odekerken 2018; Wieckowski 2019). In this case, neuromarketing would be transformed into *"stealth neuromarketing"* of which aim is to manipulate consumers only (Clark 2017, p151) in order to be in line with the preferred attitudes or needs as assigned by the ordering political party. Finally, there is an approach of *regular neuromarketing*. Among the three types of neuromarketing, however, classifying and differentiating may become knotty, especially in case of political neuromarketing. For this reason, legal and ethical codes should be in harmony.

Recommendations and guidelines for dealing with neuroethics in neuromarketing may be found in many forms and are based on the type of research (cf, eg, Hensel, Iorga, Wolter, Znanewitz 2017; Thomas, Pop, Iorga, Ducu 2017; Coutinho 2018). The most detailed proposal for neuromarketing code of ethics was introduced by Murphy, Illes and Reiner (2008) and summarised by Genco, Pohlmann and Steidl (2013).[236] In accordance with given texts, there are three crucial realms to take into account: the rights of research participants, providing evidence, and rigorous data interpretation for the media. The code proposal may be summarised into following points:

I. Research participants and their rights

All research studies that work with human beings must adhere to the scientific code of which approval from the Institutional Review Board (IRB) is necessary. Among all the participating parties, there are two omitted groups, though, and it is the research staff and company's (as the ordering party) employees. Even researchers, members of laboratories or employees may abuse the data or resell the findings. And for this reason, codes and regulations shall be applicable and enforceable for them, indeed (Isa, Mansor, Razali 2019).

i, Protection of research participants

Basic provisions include informed consents of participants, confidentiality, and particular regulations for incidental findings because any possible discovery of diseases or medical problems may come under scrutiny of ethical boards (Parker, Kienholz 2016). Dignity is, among others, another relevant aspect that has been addressed because it *"links human rights to bioethical values"* (Ulman, Cakar, Yildiz 2014).

ii, Protection of niche populations

The niche groups consist of young adults and students, children, pregnant women, disabled people or even left-handed persons and so forth because they may be harmed easily.

iii, Full disclosure of goals, risks, and benefits

[236] Other relevant reports and codes of ethics may be found in Morton and Williams (2010).

The ordering party, be it a smaller or greater company, shall always issue a document on ethical standards and principles.

II. ***Representation in the media***

Research analyses should not be announced in an overexaggerated manner as an overstatement in order to draw attention to the company if provided data cannot sufficiently support given hypotheses (eg, Stanton, Sinnott-Armstrong, Huettel 2016) Otherwise, even a backlash could follow, and the company might lose consumers' trust forthwith. In many instances, journalists and paper publishers craving for a sensation have caused a turmoil among scholars (cf, eg, Iacoboni, Freedman, Kaplan 2007; The New York Times 2007; Randall 2015).

III. ***Validity***

Developing the aforementioned, Murphy, Illes and Reiner (2008) suggest that a database of findings and data shall be at customers' disposal in order to allow the public and scholars make use of it and examine whether the research studies had not been delivered incorrectly. Contrary to research papers in academic journals, research papers for the industry do not need to undergo a peer-review procedure. Therefore, its validity may be very limited, and on top of that, the findings may actually be completely meaningless for the company.

An initiative called *NeuroStandards 1.0* and *2.0* has been established by the Advertising Research Foundation (ARF). Its objective is to offer the members good-quality peer-reviewed analyses concerning with proposed methods in research projects (Stanton, Sinnott-Armstrong, Huettel 2016). However, the most respected and exploited (eg, Olteanu 2015) code of ethics in neuromarketing has been introduced by the *Neuromarketing Science & Business Association* (NMSBA 2019).[237] Among its

[237] Another code of ethics applicable to neuromarketing has been delivered by the *European Society for Opinion and Marketing Research*, ESOMAR (2011), while further comments on legal provisions and experience were executed by Voorhees, Spiegel and Cooper (2011).

members, this strictly unbiased and independent organization aims to insist on conducting merely *"honourable and ethical neuromarketing"* (Coutinho 2018, pp155-156). In the 12 articles of NMSBA, of which members must claim allegiance to, all the essential issues are mentioned and clarified. Apart from definitions, and principles of neuromarketing and its credibility, the code deals with participants in the section of integrity of which aim is to protect anyone from being harmed or stressed. Moreover, as it is emphasised in this article, neuromarketers should never deceive participants when using them for an experiment, and no further sales may be offered to participants in the aftermath, either. Article 4 stresses transparency. According to this article, taking part must always be voluntary, and subsequently, the data and process of its collection should be made available to the clients. All aspects must then be archived with all the relevant details.

In Article 5, the NMSBA discusses the consent which is based on participants' complete understanding after having everything explained in *"layman terms".* Article 6 on privacy declares that participants are expected to be aware of the project background and furthermore, a true identity of selected participants will never be exposed, if not previously agreed by both parties. A neuromarketing research company is fully responsible for all the data, and every brain scan image or document will belong to the research institution. Article 7 on participant rights then specifies that there was no obligation to participate and a withdrawal was possible as well as the data could be deleted if requested by a participant. The data protection possesses a significant importance and follows the principles of the country in which the research is about to take place. Extending the previous one, Article 8 remarks that anyone under the age of 18 will be allowed to participate only if informed consent is signed by parents. In case of subcontracting, the research institution's duty is to announce it. The closing articles on publication, commitment, and implementation are dedicated to respecting the code, its acceptance and fulfilment. Overall, it shows that the adapted NMSBA's code of ethics represents a compromise amongst sundry ethical codes, and hence it is suitable and relevant for application in neuropolitics and political marketing research.

5.4.3 Ethics and politics

Modern roots of liaisons between politics and ethics are connected to the Second World War and its aftermath (Mason 1992). In politics and neuropolitics, it is necessary to emphasise especially political (neuro)marketing as the main discipline balancing on the border of ethical queries because it *"focuses on how public opinion research is used by political elites in forming [their] behaviour"* (Lees-Marshment 2015, p1). Basic forms of political marketing are studied in respect of ethical procedures especially in case of negative advertising and negative marketing[238] because they are known as roots of voter further cynicism, apathy and political malaise (Banker 1992). [239] Political marketing, as an instance *par excellence* to exemplify the necessity of ethical debates and its delay (Hanneberg 2014, pp235–237), foregrounded that profound and serious studies on political marketing were dated back to the early 1990s when first pioneering papers had appeared, while further deliberations in respect of ethical matters merged only in the 2000s.[240]

The problem observed in case of political marketing lies in the fact that appraising and evaluating its values and thus ethical stances cannot be done through deontological theories (ibid, p237) and, at the same time, no elaborated theories, nor procedures or methods, have been formed yet. Nowadays, moreover, the role of media has given rise not only to apathy as mentioned but also to a higher level of general awareness towards ethical questions (Freestone McGoldrick 2007, p654). And a similar

[238] More on history, aspects, and applications of negative political campaigning may be found in Bradová (2008), Dolezal and Müller (2017), Ennser-Jedenastik, Haselmayer (2019), Lebedová (2014), Matters and Redlawsk (2015). None of the aforementioned, however, immersed deeply in ethical facets or consequences of negative marketing in politics.
[239] Baker (1992, p845) then elaborates on the other side of the same coin when asking whether voters really favour rationalism or whether they succumb to manoeuvres of manipulation instead.
[240] Both these beginnings are associated with O'Shaughnessy (1990; 2002).

trajectory may be anticipated in the newly arising field of neuropolitics with neuroethics to keep up the neuropolitical research alongside. Baker (1992, p847), however, concludes that *"modern marketing techniques are not unethical".* The question is, however, whether this 1990s statement may endure and be applicable also for the 2020s standards of marketing neuroethics. By contrast to Baker, Lees-Marshment (2015, p9) did not emulate this kind of *"naïve"* attitude on the positive merits when summarising the use of political marketing as a possible *"(…) one-way communication"* for the purpose of usurping power.

Political representatives who are in office then come under scrutiny of political ethics of which importance grows, depending on the level of political engagement, meaning the municipal, regional, and national level (Marco 2017, p128). Thomas (2019) highlighted a pattern of duality in political ethics,[241] since the one mentioned by Marco (2017) represents one part only, the other one considers the morality and ethical aspects of policy and bills as delivered and approved by politicians.[242] Similarly, as in business, the political arena faces and is connected to peculiar conditions in respect of bribery, gifting and corruption (see Panda, Panda 2014, pp10–11) which makes the overall ethical assessment more exigent, especially for those *"who uphold an ethic of duty so absolute that consequences are hardly to be considered"* (Hill 1982, p388).

From the perspective of political philosophy, O'Shaughnessy (2002) identified six fundamental theoretical contributions to ethical aspects of political neuromarketing and politics. These are deontology, consequentialism, contracting views, communitarianism, objectivism, and cultural relativism.[243] A list of philosophers from

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[241] In line with Wolin (1960), Harris (2001) added that even N Machiavelli had perceived a duality of respective ethical questions and morality, and it was public and private.

[242] Subsequently, it signifies the eventualities of ethical problems based on, for instance, manipulation (see Lees-Marshment 2015, p2).

[243] This six-based list may be accompanied by hedonism or other approaches originating in medical ethics, such as *principlism* (cf, eg, Vácha 2012b; Šimek 2015), the latter connected to the four principles of bioethics (see Beauchamp, Childress 2013).

the introductory chapter dealing with the origins of connexions between politics and biology then partly reflects in the ethical analyses:[244]

i, *Deontology* is associated with Immanuel Kant whose philosophy was based on the assumption that human beings used the ratio and thus they acted rationally, and the morality originated in reason, not experience (Vácha 2012b, p33). The problem lied in the lack of context in consideration, as noted by O'Shaughnessy (2002, p1080), which played a crucial role. The Kantian approach is very frequent for inquiries of political matters; however, the exacerbating point may be observed in the fact that not even voters really act rationally.

ii, *Consequentialism,* also known due to one of its main branches as J S Mill's utilitarianism. This approach accounts for the greatest amount of criticism when stressing the *"results of actions"* (O'Shaughnessy (2002, p1081) which may be questionable in political matters. Regardless of the number of critical comments proposed by the branch, the absence of methodology and its obscure nature of inner order decreased the overall sustainability. Nonetheless, consequentialism is the eldest approach with a prominent position (Šimek 2015 p115).

iii, *Contrarian* theorists highlight, among others, the nature of politics and political marketing as *"evasive"* (O'Shaughnessy 2002, p1084), and thus predisposed to manipulative actions.

iv, *Communitarianism,* aka *virtue ethics,* builds the stances on social conditions linked to the territory of which protection is necessary to theorists of virtue ethics. In this sense, even international organisations are perceived as communities for which no strict rules should be applied. The obstacle of this approach is rooted in its core, since each territory possesses different habits and procedures in political behaviour (ibid, p1087).

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[244] As in case of the first chapter, it will not be feasible to even summarise all the facets of these philosophers, and for that reason, their stances are accented at least in outline.

v, *Objectivism* tends to emphasise the circumstances which are the only to judge the morality of given acts. This approach has been connected to Putnam's 1981 publication *Reason, truth, and history*. According to O'Shaughnessy (2002, p1089), this approach towards ethics aptly depicts the complexity of contemporary political milieu.

vi, Cultural relativism prioritises the importance of different cultural aspects and its discord. At the level of individualism, however, the differences disappear forthwith as in case of bribery, for example (ibid, p1090).

Even though these critical approaches towards political ethics may be transmissible and applicable to neuropolitics too, the fact is, however, that further research and clarifications are needed in this area. The uniqueness of this field resides in its foundations in political behaviour and the tools neuroscience, and its application, and therefore the conditions before, in the course of employment, and the consequences as well should be taken into account. Hence Cortina (2010, p145) has identified three routes of political neuroethics that neuropolitical practitioners should follow. First, to expand upon prior endeavours to form a *"universal code of ethics"* specifically and importantly, based on the human brain. Secondly, when rejecting the former, one should realise that no universal key will ever be created. Therefore, *"propensities to accept"* ethical codes should rather be inquired. And finally, the third option accentuated the global interdependence without any need to keep in touch and under approval of every person in the world. Yet it implies that *"social pacts"* should be imposed, instead of any universal codes, and these will function due to *"altruismo recíproco"* (2010, p146).

5.4.4 Implications and recommendations

As in case of neuroscience and its contemporary fashionableness (Conrad, De Vries 2011), neuromarketing and neuropolitics have gradually become an indispensable ingredient of research. And indeed, it is natural part of science to analyse human behaviour and thus contribute to these blooming fields thanks to the valuable knowledge neuroscience has gained in the past periods of time. However, this relation may be found only fractionally reciprocal since especially neuromarketing practitioners, in contrast to neuropolitics, are not necessarily scientists publishing their research findings in peer-reviewed journals (Hensel, Wolter, Znanewitz 2017). And it demonstrates that another strikingly problematic aspect may lie in the non-academic neuromarketing approach *per se*. Nevertheless, neuroethics should endeavour to develop itself into a regular discipline not only in the academic environment (Roskies 2002; Illes 2007), but moreover, is should set borders and determine neuroethical concerns for the near future (Murphy, Illes, Reiner 2008). On this account, the identified role of neuroethics should be of a ternary character. First, neuroethics should keep on being empirical and thereby investigating the results of neuroscience for further considerations. Second, in accordance with the former, it shall be descriptively interpretative, and therefore neuroethics should be able to: *i,* verify or falsify hypotheses on neuroethical issues; and then *ii,* put them into context from a historical perspective and medical experience. And finally, *iii,* neuroethics would not meet the criteria without being deliberatively normative while using the knowledge of bioethics and philosophy so that, in line with the other two roles, pioneering, and universally applied prescripts and borders might be defined or modified respectively.

Only if these *sine qua non* roles are consistently fulfilled, the relevance and significance of neuroethics may be finally proven. The problem, however, lingers on the assumed labour shortage rising in this *mariage de convenance* of neuroscience to social sciences and *vice versa*. And since neuro-x fields operationalise on the highest level of interdisciplinarity and enters other areas of social sciences, there is a very limited number of people educated and sufficiently trained in neuroscience and physiology and, at the same time, knowledgeable in corresponding social or political phenomena in order to be sufficiently able to analyse and interpret the findings (Petlach 2019b). On the whole, the future of neuroethics inheres in itself and its ability to combat prejudice not only from within (cf, eg, Illes 2007), but also with respect to the outside world (Farah 2005). Legrenzi and Umiltà (2011, p85) contrasted that neuroethics and corresponding fields and disciplines *"demonstrate that not all theoretically possible judgements are psychologically plausible and performable in cognitive terms"*.

Ultimately, Ulman, Cakar and Yildiz (2014) identified three possible neuromarketing trajectories that could be expected. First, neuromarketing may be subject to no restrictions and thus it would enjoy a full independence. However, a higher level of abuse and ethical damage could emerge as a consequence. Secondly, a new, detailed and elaborated set of rules and prescript should be imposed particularly for neuromarketing. Research institutions, academia, and the industry would have to comply with them. Finally, neuromarketing could be banned, be it a partial or complete prohibition by national governments. In this option, France represents a pioneering example of banning neuromarketing as a whole. According to Article 16.14 of the French Code Civil from 2011: *"brain imaging techniques may only be used for medical or scientific purposes, or as part of forensic expertise…"* (Le Code Civil 2011).[245] This ban, however, cannot be as mighty as desired because for the purposes of research, neuromarketing practitioners only need to conduct their research in any other neighbouring country or if possible, experiments may be conducted while employing other tools, such as eye-tracking, which are not included in the legal provision. This

[245] In the original, it is literally declared that: *"Les techniques d'imagerie cérébrale ne peuvent être employées qu'à des fins médicales ou de recherche scientifique, ou dans le cadre d'expertises judiciaires. Le consentement exprès de la personne doit être recueilli par écrit préalablement à la réalisation de l'examen, après qu'elle a été dûment informée de sa nature et de sa finalité. Le consentement mentionne la finalité de l'examen. Il est révocable sans forme et à tout moment"* (Le Code Civil 2011).

type of circumventing the law only leads to a squandered chance to keep a good track of neuromarketing. An exaggerated argument has been then put by Zuidgeest (2019) stating that any disapproval of neuromarketing is the same as opposing marketing as such. On the other hand, as concluded by Wieckowski (2019): *"fuelling consumerism as consumer debt rises is an ethical concern"* which as a statement vigorously endorses other previously mentioned studies (eg, Ruanguttamanun 2014). Kováč (2012, p301) summarised that this situation results in *"de-cortication of humans, obnubilation of intellect, abolition of living within time"*.

In defiance of adverse criticism, neuroethics will continue to overlap other neuro-x fields and disciplines. Stanton, Sinnott-Armstrong and Huettel (2016), when studying similarities between marketing and neuromarketing, concluded that four spheres mingle and are to endure. Initially, the expensiveness of (neuro)marketing will be reflected in the final price consumers will have to pay for given products. Another shared aspect is the absence of Institutional Review Boards (IRB) which would supervise the projects. This remark brings back the other initial problems as the lack of experience in the field, and even making a great mistake when neglecting neuroethics as a whole. Thirdly, (neuro)marketing companies do not need to worry whether consumers' decisions harm their health as in the cases of tobacco products, drugs, and unhealthy food. Last but not least, a high level of predictability may endanger societies in every country of the world.

Most interestingly, neuromarketing is anticipated to blossom especially in political public relations (PR) and marketing (see Santos 2016). Regardless of financial benefits as the principal demand, the problem is, however, that whereas in neuromarketing and its economic sense, there are products to be sold and bought, in neuropolitics and neuromarketing, free will and free future of the state might be affected unfavourably. In this situation, if neuromarketing were misused, political regimes would probably be transformed into a different form of political regimes. *Ad absurdum,* it would not be, most definitely, a democratic one (cf, Gutierrez-Rubí 2009; Wolinsky 2019; Schreiber as quoted in Svoboda 2018). Henneberg (2014, p237) had previously shared a similar concern regarding the role of political marketing and its possible ELS ramifications and seamy impacts on democracy. In his philosophical paper, Pérez-Zafrilla (2018, pp106–107) expressed an unfavourable attitude when he was scathing about further applications of neuropolitics in case of deliberative democracy. Specifically, he stressed ethical problems together with measurement difficulties neuroscience might not be able to fight.

After all, neuroethics is supposed to draw a clear distinction between human beings and mere items (Farah 2004). And owing to many vital aspects and research measures neuroethics has been expected to untangle (eg, Gordijn, Buyx 2010), it could become more than an arbiter for deciding whether a research project might either potentially pose a threat or be plausible. However, it will not be technically feasible to deal with more specific case studies and meta-analyses without gradual debilitations of constant dwell on contrafactual studies as obvious in neuroethical literature (see Farah 2012). Regarding the scepticism surrounding neuromarketing and corresponding neuroethics (Murphy, Illes, Reiner 2008), it is essential to appraise the possibilities and prospects into deep (cf, Lim 2018) once again before jumping to conclusions that neuroethics may be of no great significance. After all, there is a reciprocal relation between neuroscience and ethics (Farah 2010; Glannon 2011), stressing that neuroscience needs neuroethics and *vice versa*. With the rise of neuroscience and neuromarketing with more than 200 companies making use of it, an obvious growth of neuroethics is to follow as a *"pressing"* issue (Gold, Roskies 2008). Similarly, it may be expected in case of criticism casting doubt upon the justifiability of ethics as a whole (Racine 2010). And for this reason, it is crucial to observe which directions of neuroethics scholars might eventually determine (see also Illes 2009). However, it is inevitable that every revolution, be it scientific or societal, always devours its own children.[246]

[246] Reversely and more importantly, as observed and pointed out by the *Nature Human Behaviour* (2020); research studies in life sciences shall always be registered beforehand because otherwise, there are serious tendencies and attempts to manipulate the research questions, design, and methodology in

6 THEORETICAL TURNABOUTS IN PERCEPTIONS OF IDEOLOGY

The basis of ideology is an apt instance of modifications in understanding and usage. Its roots may be dated back to 1796, when Antoine Louis Claude Destutt de Tracy coined the term to establish a new field of research. Ideology was then expected to become a superior type of science, unifying the others as the science of ideas (Stråth 2013, p4). Therefore, it appeared as a very first interdisciplinary standpoint. Whilst this first step may be seen as optimistic and neutral towards scientific discoveries, it did not last long, because Napoleon Bonaparte shifted understanding of the term to a politically pejorative realm. Since that time, ideology has been deficient of its initial academic sovereignty, and the core of ideology, as understood nowadays, has resided in a system of *"socially shared ideas"* (van Dijk 1998, p15). The Enlightenment was then indispensable to the prevalence of ideology, especially due to the outcome of the French Revolution, which had witnessed the formation of two elemental societal groups (Mooney 2012c), albeit in a *"metaphorical"* manner (Cameron 1996, pX). From that moment on, each chamber of deputies or other representatives has been perceived as divided into two, to imply different ideological beliefs. On this account, ideology is specifically used to propose duality, something what Bobbio (1992, p2) termed as a *"typically dyadic way of thinking"*. Whereas, in an integrating role, it unifies distinctive clusters of people, with a disintegrating purpose, on the contrary, it singles out those whose ideas and attitudes would not be in harmony with other members. Hibbing, Smith and Alford (2014a, p297) thought back on ideology from a historical perspective to conclude its ubiquity across the centuries. The only difference had lied in the terminology used for contradictory groups, until the above-mentioned French Revolution finally produced the terms *rightism* and *leftism* (Laponce 1981). Up to the present, nonetheless, scholars have frequently

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order to give evidence and prove the data to one's liking. This unfair practice as committed by many scholars should not be backed and/or tolerated in academia in the near future.

omitted the biological origins and triggers wherein these political beliefs root, notwithstanding the long-term nature of this research concern.

Hostile stances on ideology, however, persisted in the *long* 19th century and escalated in the *short* 20th century with the concept of ideological extremes (Hobsbawm 1994). At first, Karl Marx and Friedrich Engels disparaged the idea of ideology as irrelevant and questionable, one which, as they insisted, originated in the *"false consciousness"* of ideology (van Dijk 1998, p96). Their work served the propagandist need, albeit in a reversed rendition. The 20th century was then built on ideological foundations, and its clash may be seen not only in the Great War and the Second World War, but even in other minor conflicts taking place at that time. By the end of the Cold War, scholars again tended to believe that ideology might be considered to be outdated (see Jost 2006, p655). This was not sensed by all of them, though. While Fukuyama (1992) regarded the breakdown of the Soviet empire as the closing down of ideological disputes, Schwarzmantel (1998) gave his support to an opposing hypothesis. [247] According to his opinion, if ideology ceases to exist, there may be serious jeopardy on the horizon (cf, Fukuyama 1992; Schwarzmantel 1998). However, Sartori (2008, p90), as well as Jost (2006, p667), rejected these opinions on the end of ideology as such when aptly summarising that *"yet the decease of ideology does not imply that the ideological mentality, the forma mentis as the glasses one has to view the world, have disappear".*

Regardless of dissimilarities amongst scholars, there is another aspect to bear in mind when stressing the current perception of ideology. This dividing line may be found in the distinction between the West and East of Europe. In England and the western part of the Continent, ideology represents a tool to classify voters and political supporters into groups. In Eastern European countries, by contrast, people do not like the concept due to its connexion to the former non-democratic regimes under the sphere of Soviet influence. And this discrepancy still plays a noteworthy role (Aspelund, Lindeman, Verkasalo 2013; Piurko, Schwartz, Davidov 2011). Nonetheless,

[247] Another renowned book of essays was delivered by Bell (1960) who highlighted the societal changes as crucial factors for a decrease of ideological meaningfulness.

the role of ideology remains indispensable for neuropolitics and experimental political science as a stepping-stone (Freestone, McGoldrick 2007).

6.1 Nexuses between the human brain and ideology

A political leaning right or left is currently taken for granted, and there are three ways in which one may understand a man's ideological behaviour as, in Aristotle's words, everyone is a *political animal* (Kullmann 1991; Hatemi, McDermott 2011). The first approach investigates political behaviour from the perspective of political science and philosophy, and thereby emphasising dissimilarities in certain aspects of elections, historical circumstances, political contexts, parental and social influences. The first scholars of this approach may be found in the ancient times, and it re-emerged again in the 20th century (Tomkins 1963; Carney et al. 2008). Second, being conservative or liberal has been examined by psychologists. Their studies are based on experiments, surveys, and questionnaires to declare a dissimilitude in behavioural patterns and personality traits. Socially neuroscientific research, as the third option, goes further, since its aim is to give evidence of distinctive differences amongst people, and between these two groups in particular, in their neural activity. In defiance of all approaches, evident differences between these two groups are observed and confirmed (see Hibbing, Smith, Alford 2014a; Hibbing et al. 2014b; Jost et al. 2003). However, the necessary left-right spectrum as a tool is not able to compass the extreme and radical left or right tendencies which are relevant to political scientists (see Kerlinger 1984, pp18–22).[248]

In political science, the theme of liberalism and conservatism has a cardinal position, especially in the USA where the very appellation (Republicans vs Democrats) prevails. After the presidential victory of Donald J Trump, research in this area of

[248] All three approaches employ the left-right scale (spectrum/axis/continuum). They differ in how they number its magnitude, starting at a 1-5 spectrum, followed by some studies applying 1-7, 1-10, or 1-10 axes.

physiology and politic has intensified (cf, eg, Carney, Enos 2003; Jost, Nosek, Gosling 2008; Schreiber et al. 2013; Lakoff 2016; Lakoff, Wehling 2016; Samuels 2016; Hegazy 2019; Jasko et al. 2020; see also Grossmann, Eibach 2020). Despite some scholars' dating of the opposition of liberals and conservatives to the outbreak of the French Revolution (Jost, Federico, Napier 2009; Smith et al. 2011), it is possible to go further into the past and observe its origins within the early stages of Christianity (Jost, Amodio 2012). According to conventional works in political science and philosophy, conservatism is associated with traditions, values, support of the current state of matters, and a distaste for fast changes, revolutions and myths in comparison to facts. The system of hierarchy is also inviolable as well as loyalty (Oakeshott 1962, p69). Liberalism, on the other hand, sprang from the refusal of the then absolutist power of monarchies, and furthermore, the liberals are known for promoting individual rights and freedoms, together with equal opportunities in the political franchise or other aspects of everyday life (see Kerlinger 1984, pp14–17).

The political-psychological point of view seeks to discover and comprehend specific personality traits and patterns of behaviour. Initial research studies in this approach may be found in the ancient times as well (see also Roiser, Willig 1995). The Greek philosopher Theophrastus, who actually followed Aristotle's work, was amongst the first to study the human personality (Gerber et al. 2010). From today's perspective, his work would be equivalent to behaviouralism. The modern era in such studies had its origin at the turn of the 19th and 20th century and was connected to the Leipzig-based theorist Wilhelm Wundt (Jost, Federico, Napier 2013). However, *The Authoritarian Personality*, a truly controversial and methodologically biased book, has been the most salient for this approach (Martin 2001).[249] It was issued by the team of Theodor W Adorno (1950). Many hypotheses stated in the book are being examined even nowadays (cf, eg, Jost et al. 2003; Weber, Federico 2007; Hennes et al. 2012;

[249] Jaume et al. (2019) characterised the development in studies dealing with authoritarian personality from Adorno in the 1950s to Rokeach's concept of dogmatism in the 1960s to Altemeyer in the 1980s.

Hasson et al. 2018).[250] The authors then related conservatism to authoritarianism. The book's content lies on the border between political science and psychology. Overall, scholars of the second approach share the range of instruments of psychology, for instance, the right-wing authoritarianism (RWA) model, social dominance orientation, the belief in a dangerous world, and the Big Five (see also Koukolík 2012; Gerber et al. 2010).[251] In this respect, conservatism is usually attributed to and perceived as a deviant instance (see Bhattacharya 2007). Wilson (1973, pp11–12), however, discerned three hypotheses focusing on the nature of conservatism which are depicted in Table 9.

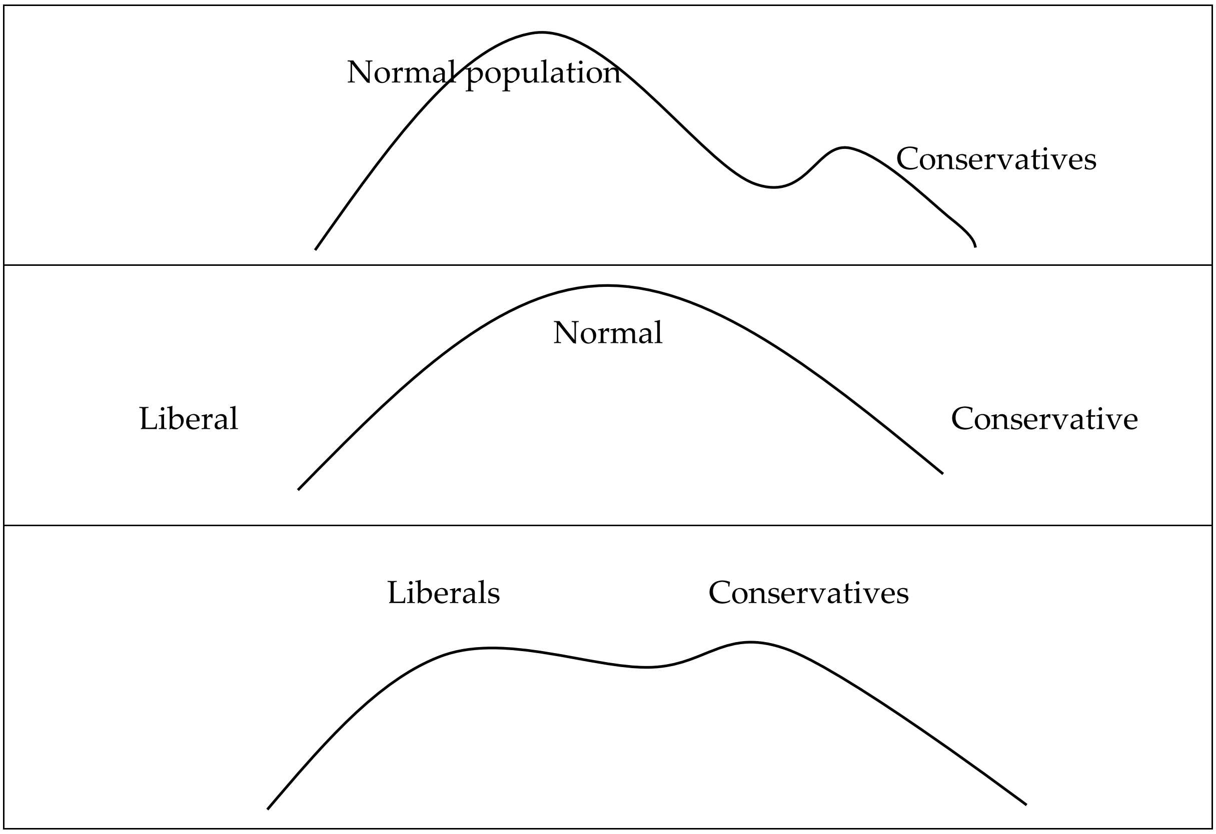

Table 9 The nature of conservatism in three variants
Source: Wilson 1973, p11

[250] Another relevant contribution to the debate on the concept of authoritarian personality may be associated with an edited book of Christie and Jahoda (1954).

[251] The Big Five model classifies human personality traits into five distinctive categories: *openness, conscientiousness, extraversion, agreeableness, and neuroticism*. They may be abbreviated to OCEAN or CANOE.

According to his study, it is the above-mentioned deflection in case of conservatism, secondly, it is a widely assumed normal distribution, and finally, there is a bipartisan polarisation scheme in population. None of them, as the author explains, can be comprehended as the most apposite one that might be universally applicable. Albeit literally cherished amongst scholars (see Roets, van Hiel 2006; Etchezahar, Brussino 2013), the connexion of conservatism to authoritarianism is another problematic aspect,[252] although it has already been falsified (Stenner 2009). Lately, however, a new trend of Eastern European left-leaning authoritarianism has emerged amongst local citizens (cf, de Regt, Mortelmans, Smits 2011; Lindgren 2012). Other observed figures and data from political psychology are as follows.

Liberals tend to be allied to rights and justice, conservatives prefer loyalty and respect for authorities when it comes to morality, and any social danger may affect possible changes in opinions (van Leeuwen, Park 2009). Similarly, liberals are in favour of trade-offs and compromises, while conservatives are consistent in their attitudes (Critcher et al. 2009). Moreover, conservatives react differently to sundry stimuli and exhibit different cognitive styles, as observed by Carraro, Castelli and Macchiella (2011) and Conway et al. (2016). A vast majority of the aforementioned, however, use the most sensitive questions, which may be disputable (Inbar, Pizzaro and Bloom, 2009). Having said that, conservatives are still disgusted more easily by situations contradicting their values or opinions (ibid). Generally, this approach considers conservatism, as a *"motivated social cognition"* (Jost et al. 2003, p340; Nail et al. 2009, p902; Fraley et al. 2012, p1426), to be deviant in comparison with liberalism. Furthermore, in respect of authoritarianism, prejudice is being perceived as a possible variable to help explain differences in personality traits and ideological leanings. In the latest findings, a study (van Hiel et al. 2019), using the RWA model, confirmed that conservatism is associated with a lower rate of emotional abilities, but a greater level

[252] From a philosophical angle, Rádl pondered upon authority as a *"voluntary"*, yet *"binding"*, principle embodied strictly in moral laws in the name of God. Rádl summarises that human beings are therefore *"in authority's service"*, which also implies that [authority] is *"incognisable"* and *"controls everyone"*, but on the other hand, people may *"refuse to obey"* (Rádl quoted in Havlíček 2005, pp286–287).

of prejudice, and *vice versa* in case of liberals. When discussing prejudice, Ditto et al. (2019) recently delivered a meta-analysis focusing on partisan biases in case of given groups of people, and they verified that everyone prioritised or biased information in accordance with political beliefs, regardless of their political orientation (see also Keene et al. 2017).[253]

Interestingly, a conservative shift may take place even amongst liberal individuals (Bonanno, Jost 2006), being mostly caused by the post-traumatic stress disorder (PTSD). So far, there is no significant research on a liberal shift. However, it is suggested that such a shift might be caused by an increase in education and travel (Jost, Nosek, Gosling 2008).[254] According to other analyses, conservatism, with its resistance to change and revolution, results from a higher level of orderliness and politeness (Hirsh et al., 2010). It was concluded by Schlenker, Chambers, Le (2012) that conservatives are also happier, but this was later disproved, and modified to them being just satisfied [with the status quo]. Therefore, they may be more content than liberals who agonise excessively over the cruelty of the world (Choma, Busseri, Sadava 2009, p504). With regard to education, cultural aspects, and parental influence, it was confirmed that these traits in political personalities originate from a genetic basis (Gerber et al. 2010).[255] In their critical response to Hibbing, Smith and Alford (2014a), Robbins and Shields (2014) argued in favour of their dual approach to ideology which shall be based both on individual traits in bias as well as empathy, rather than depending only on individuality.[256] Figure 28 is then a reproduction of four routes leading to conservatism and liberalism (see also Simas, Clifford, Kirkland 2019).

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[253] In a differently modelled research study without ideologically based cooperation, Mansell (2018) ascertained this biased tendency manifest itself especially in case of conservative Republicans, while liberals show a higher rate of trustfulness.

[254] On a long-term basis, Matthews, Levin and Sidanius (2009, p934) examined university students and their shifts in respect of threat perceptions. According to their findings, and in line with other studies, conservatism functioned as *"part of motivated social cognition".*

[255] This that genetics affects political behaviour is more predominantly supported by conservatives, while liberals think otherwise. An opposite situation occurs in case of homosexuality being genetically determined. The latter is more significantly supported by liberals (Suhay, Jayaratne 2013).

[256] By contrast, Graham, Nosek, and Haidt (2012) emphasise that individuality in questions of morality plays a role, since liberals incline to "individual-focused moral concerns", while conservatives tend to

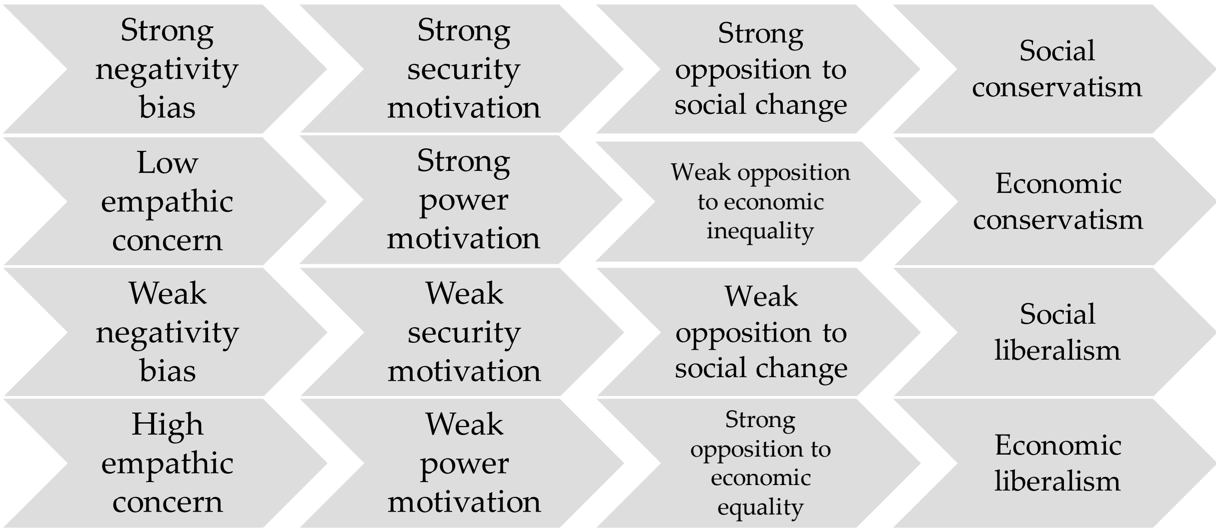

Figure 28 Psychological routes to ideology
Source: Robbins, Shields 2014, p327

There are also comparative and longitudinal studies concluding that kindergarten children show certain differences in behaviour which may be mirrored in their consequent political and ideological attitudes. According to the data, more active children tend to be more liberal, those who experience more fear usually lean right on becoming adults (Fraley et al. 2012). The role of intelligence remains disproved (Block and Block 2006). Some authors have adopted political neuroscience even more in depth when focusing on international relations, racism, and terrorism (Decety, Pape, Workman 2018). In this matter, empathy was found as a principal constituent of research (Burke, Kosloff, Landau 2013; Hasson et al. 2018; Decety 2020). Indirectly, some statements even presume on empathy as a means to bring lasting peace (Baron-Cohen 2011).[257]

"group-focused" ones, and thereby, once again, highlighting the differences in preferences between compassion and authority (see also Graham, Haidt, Nosek 2009).

[257] Kováč (2010, p815) also expressed another attribute indispensable for peace which resides in religion as a variable. According to his view, the importance of spirituality is not able to overbalance secularisation.

Geographically, the Iron Curtain has been in existence up to now in psychological perceptions and interpretations of ideological leanings (see Kossowska, van Hiel 2003; Thorisdottir et al. 2007). Whilst conservatives of the West and East decline to support fast change within their societies, only western conservatives accept inequality as a fact. On the whole, sociodemographic values divide these two Cold War regions, and subsequently it even segments Eastern Europe into minor subgroups (Aspelund, Lindeman, Verkasalo 2013; Piurko, Schwartz, Davidov 2011).

6.1.1 Neuropolitics on political leanings

From the neuropolitical angle, it is feasible to uncover more concealed cruxes of political orientation and behaviour, and therefore ideology came into focus once again (cf, Bolland 1985, p248). Chronologically, first experimental investigations had employed EEG as the examination tool, later on, fMRI has been included into the scope of instruments due to an increase in availability, and EDA, eye-tracking or fEMG have joined in the meantime. A pioneering paper of greater implications is associated with Amodio et al (2007). For an EEG study, they used 43 participants. They were given simple Go/No-Go tasks to fulfil so that researchers could subsequently analyse participants' event-related potentials (ERP). They concluded that ideology has proved to be, at least partly, a variable explaining differences amongst people. In conclusion, conservatives exhibited a lower level of sensitivity while responding to conflicts. Liberals manifested themselves as those with higher efficiency in the tasks and *"greater neurocognitive sensitivity to cognitive conflicts"* (Amodio et al 2007, p1247), while conservatives succeeded in the tasks based on constant reactions. These rudimentary findings emphasised that *"ineffable constructs, such as ideology, are reflected in the human brain"* (ibid). Other analyses employing EEG followed. Zhang et al. (2014) used the presidential debate held in 2012. The total of n=20 participants watched it whilst researchers observed their reaction to gestures. As ascertained in the EEG study, Mitt

Romney had managed to win the first debate thanks to the use of gestures and engaging the audience which had lacked in Obama's performance. In another EEG experiment, Ramaraju et al. (2015) found out that two examined participants experienced a dominance of *ß* waves when observing the State of the Union delivered by President Barack Obama which was meant to highlight the complexities linked to obstacles in measuring emotions. Morey (2017) pointed at the difference between Republicans and Democrats when watching 24 political advertisements, each lasting 30 seconds, while being examined by EEG. The study discovered that Republicans usually remember positive ads, and this logic works the other way around for Democrats. Amidst these studies, there is an enduring tendency to predict outcomes of American presidential elections (cf, Todorov et al. 2005). Nonetheless, it is questionable whether these findings are portable and may be widely applicable in other territories but the USA (see Zmigrod, Rentfrow, Robbins 2019), especially when concerning, for example, the gestures and the style of political campaigning.

Non-American, EEG experiments were conducted, for instance, in Italy and Poland. In the former country, EEG was applied in separate case studies across Italian politics. While in the first one of them, Vecchiato et al. (2010a) exemplified the α, *ß*, γ, and θ waves of 13 participants when watching a documentary film with either ads or the PM's (Silvio Berlusconi) speech. In this case, researchers concluded that ideological supporters of S Berlusconi were aroused but the *swing voters* were not sufficiently convinced by Mr Berlusconi. The surface waves were converted accordingly as depicted in Figure 29. In the upper scan, there is the cerebral activity of swing voters, the brain scans of Mr BersIusconi's voters are below. In these distinct results found in in the theta band, the yellow and red areas were active in comparison to the grey ones which remained in a resting state (ibid, p4).

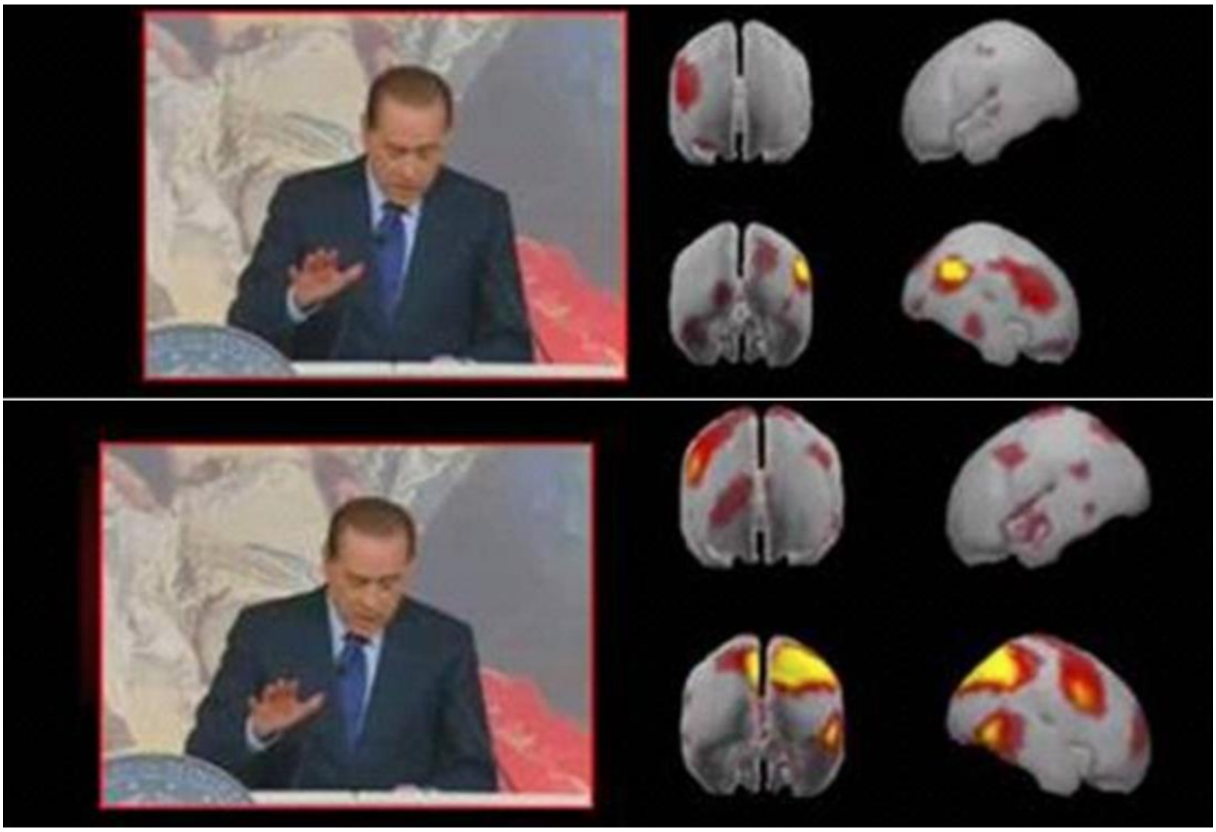

Figure 29 Dissimilar brain scan images of Italian voters
Source: Vecchiato et al. 2010a, p4

In the same year, Vecchiato et al. (2010b) analysed the first impressions of 8 participants after showing photographs of local politicians. Similarly, an EEG study of Vecchiato et al. (2014) examined the cortical regions of interest (ROIs) amongst 20 participants in order to appraise their assessment on dominance and trustworthiness after seeing photographs of politicians. In the latter case, Maison and Oleksy (2017) inquired and scanned 33 participants in Poland in accordance with their preferred presidential candidate. This analysis, however, considered only tolerance and conservatism in relation to Andrzej Duda and Bronisław Komorowski, and the acceptance of lesbian, gay, bisexual, and transgender minorities (LGBT). As palpable and not surprising in this case, more tolerant participants very more LGBT-supportive. Moreover, the only (and negative) correlation at the level -0.42* appeared between conservatism and the preference for Komorowski (Maison, Oleksy 2017, p285). And unfortunately, the left-right scale, nor other political aspect, had been considered in their study.[258] All the aforementioned experiments may draw attention back to a primal EEG study of Morris et al. (2003, p727) concentrating on the process of priming of political terms. In this course of *"hot [ie, political] cognition"*, political term produced negativity as of the peak latency of 400ms among ERP of 11 participants. More importantly, the mechanism of this cognition remained unknown (ibid, p742).

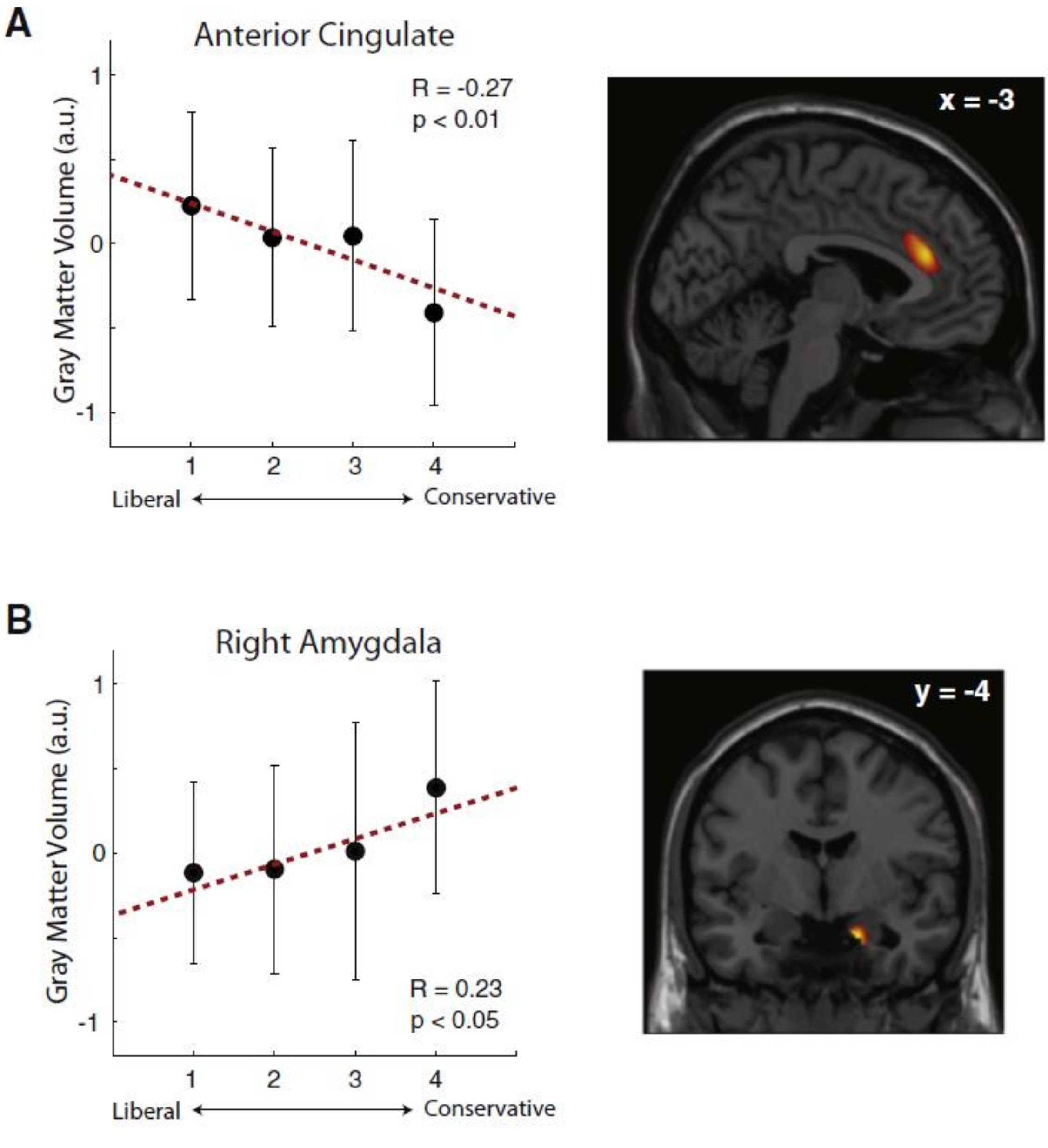

Figure 30 Brain scan images of ROIs in liberal and conservative brains
Source: Kanai et al. 2011, p678

[258] A psychological analysis on Polish conservatism and its association with aggressive action may be found in the study of Golec de Zavala, Cisłak, Wesołowska (2010).

Anyhow, even a mere sense of interest in politics is linked to the amygdala and ventral putamen (Gozzi et al. 2010). In general, political knowledge is associated with frontal lobes (Knutson et al. 2006). No brain region exhibits a positive correlation with liberalism; it is, nevertheless, strongly associated with a greater volume of grey matter in the anterior cingulate cortex (ACC), which signifies a higher level of openness. Significant for conservativism, by contrast, is the right amygdala and its size: the greater it is, the bigger the probability of conservatism (Kanai et al. 2011). These ROIs are confirmed and depicted as the brain scan images in Figure 30. The amygdala, responsible for fear processing, not fear itself, has been confirmed by other studies as pivotal for those leaning right. In addition, the size of the ACC was linked to differences in the cognitive behaviour between these two groups.[259] In a study on political orientations, researchers analysed respondents in accordance with their reactions to faces of American presidential candidates. The undeniable role of fusiform gyrus was subsequently verified. The functional magnetic resonance imaging provided evidence of the activation of other regions, namely the dorsolateral prefrontal cortex (dlPFC), insula, ACC, motor area, the cuneus, and precentral gyrus (Kaplan, Freedman, Iacoboni 2007).

In an fMRI study, Spezio et al. (2008, p348) conducted two experiments in which the researchers observed differences in reactions of 24 participants to winning versus losing politicians. Whilst those politicians who were known as the winning ones did trigger no series of reactions in the human brain, defeated and thus losing politicians *"elicited robust activation in both the insula and ventral anterior cingulate cortex"* (vACC) which are both connected to reactions to physical appearance, be it in a positive or negative perception. The process of bilateral insula activation in the course of participants' voting is depicted in Figure 31. Both left and right insula thus exhibited a negative correlation in connexion to the lab vote. As authors added, these regions,

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[259] Fatfouta et al. (2016) also confirmed that the brain activity in the mPFC and dorsal ACC is linked to the level of acceptance of unfairness. The same findings were partially confirmed in regard to the ACC and conservative values (Weissflog et al. 2013).

together with the parainsula, are linked to the amygdala, the main centre responsible for negative leverage (ibid, p349). Similar to the aforementioned studies, Westen et al. (2006) in a pioneering fMRI study discovered that politics also influences so-called motivated reasoning when activating specifically the vmPFC, ACC, posterior cingulate cortex, insular cortex, and the lateral orbital cortex (lOFC).

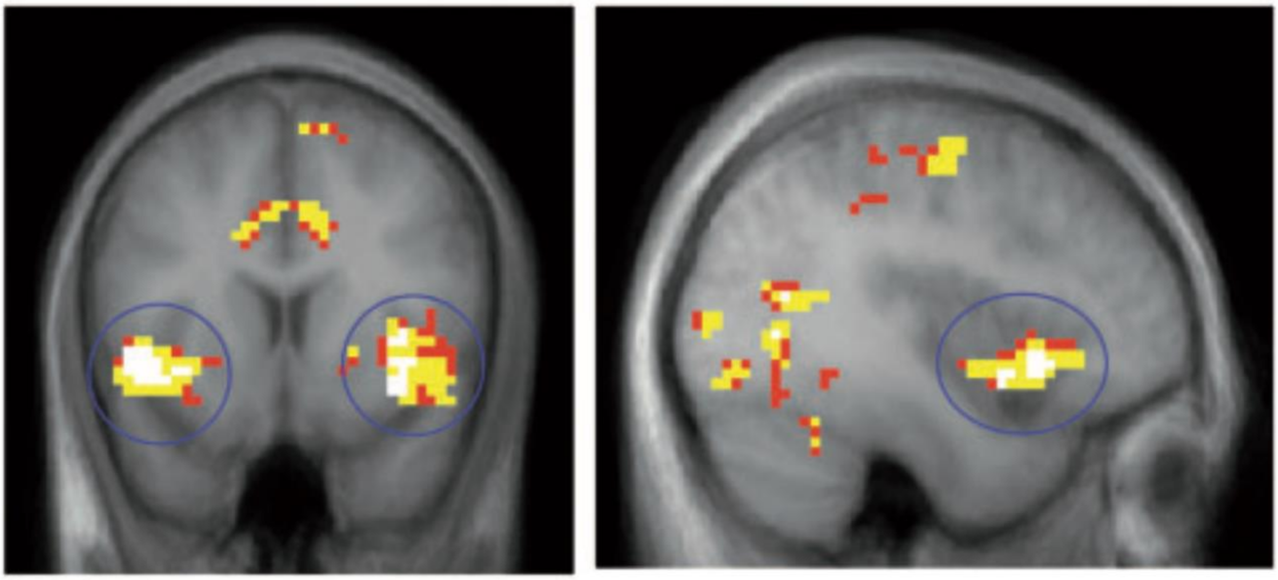

Figure 31 Brain activation in the course of voting
Source: Spezio et al. 2008, p346

Importantly, the left and right leaning is then influenced by parental socialisation, the genetic aspect as well as the neurotransmitter function shall not be neglected, though. Both of these two groups use the same brain regions when discussing domestic politics but doing so differently. As depicted by the BOLD fMRI signal of Fowler and Schreiber's (2008) study in Figure 32, the blood level oxygen has grown and thus coloured in red and orange, and the mPFC was in a resting state when participants discussed issues of domestic [American] politics.

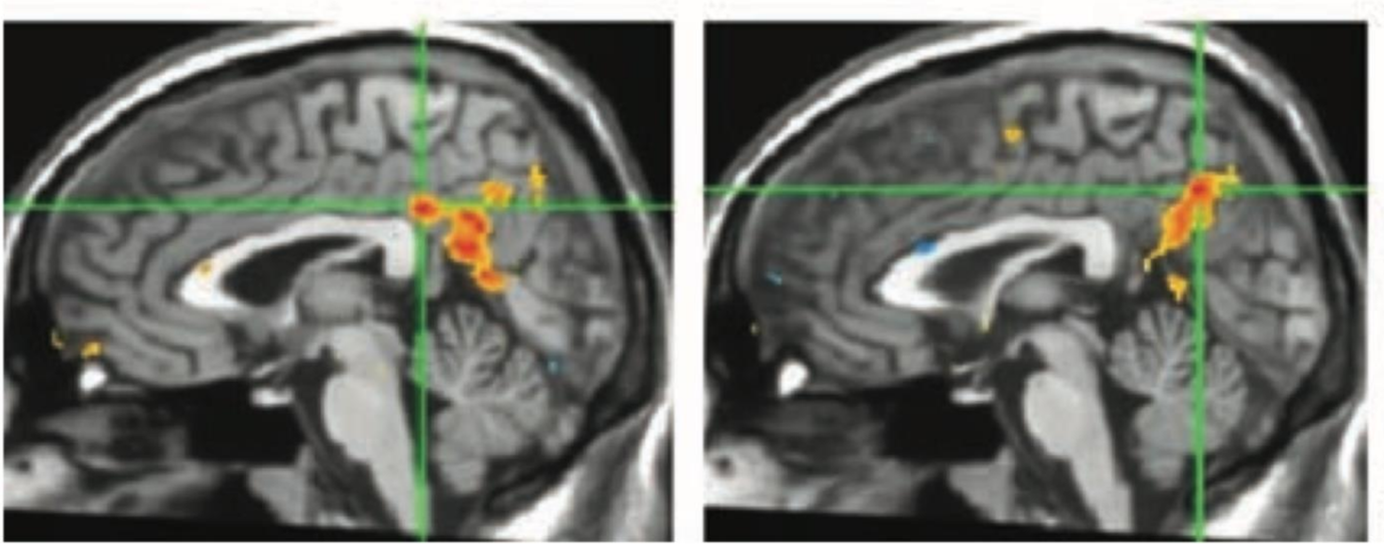

Figure 32 Brain activity of liberal and conservative brain
Source: Fowler, Schreiber 2008, p914

When discussing the conservative shift, it is necessary to put an accent on the fact that everyone, irrespective of his or her political orientation, who starts thinking conservatively, also experiences a greater brain activity in the dlPFC (Zamboni et al. 2009). Although conservatives and liberals act similarly at first sight, their brain activities vary fundamentally. As exemplified for risky situations and fear, liberals had their left insula activated, whilst conservatives, on the other hand, were more sensitive towards the whole situation, and the right amygdala was more active instead (Schreiber et al. 2013). As summarised by Amodio et al. (2007) and Mills et al. (2016), the cognitive thinking of liberals and conservatives entails different modes of information processing. Cross-culturally, however, Rule et al. (2010) examined participants originally from the USA and Japan in one fMRI study. According to their findings, politicians for whom participants wanted or did vote for caused strong reactions from the bilateral amygdala. On the other hand, this activity was not elicited by politicians to whom participants did not feel inclined to. The occurrence of bilateral amygdala was then registered amongst all the participants, ie, regardless of their nationality.

Some attempts at neuropolitical analysis have been lacking in rigorous data interpretation (see Gray 2019), as in the case of another set of expectable results which were delivered when declaring liberals to be benevolent and generous, while conservatives were labelled as manipulative and authoritarian (Verhulst, Eaves, Hatemi 2012). A careless mistake resulted in an infamous confusion, and therefore, an inverse hypothesis is valid (Lieberman, Long 2018). Similarly, Decety et al. (2015) had to retrieve their paper which had suggested that religion negatively affected generosity across the examined sample, even though it was the territory of origin to play this role instead as researched subsequently particularised.[260] On top of that, no neuroscience-based study has been published on those who label themselves as moderate or centrist, ie, independent in America. Presumably, understanding these two populations may be subsequently profitable for many sectors of business, politics, and, by implication, even law, economics, and philosophy.

The number of studies employing electrodermal activity (EDA) in connexion to politics is more than restrained, and fEMG has been mostly omitted (Hibbing, Smith, Alford 2014a, p302). Amidst studies examining electrodermal activity, researchers make use of aversive and appealing photographs in order to differentiate political leanings amongst examined participants. Their conclusions (Dodd et al. 2012; Oxley et al. 2008) put an accent on the fact that conservatives pay attention to aversive photographs significantly more which elicits greater physiological reaction. By contrast, liberals rather concentrate only on agreeable photographs. Oxley et al. (2008) put this aspect into context of brain neuroanatomy when stressing the role of amygdala in comparison with other ROIs, and hence they summarised that political orientation is conditioned by physiological predispositions.[261]

Hatemi and McDermott (2012), however, brought back the conditionality problem for which a simplifying term had been established. This *"chicken or the egg problem"* signifies the same aspect of causality as mentioned by (Morris et al. 2003) on EEG studies. Hatemi and McDermott (ibid, p308) draw attention to former perceptions based on beliefs that *"behaviour results from a complex conversation between biology and*

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[260] Ackerman and Jahoda (1950) issues one of the first rigorous studies on religious aspects and psychopathology in the book on anti-Semitism.

[261] In this regard, Oxley et al. (2008) also specified the indispensability of genetics for political leanings which cannot be influenced by anyone.

environment." Nonetheless, in neurobiology and physiology, this linear relation cannot be defensible. While Hibbing et al. (2014b, p112) favoured biologically based propensities being in charge of consequent behavioural traits as *"[they are] the results of the particular manner in which each individual's predispositions systematically distort their environmental experiences"*, Joost et al. (2003) had previously suggested that political behaviour and the conservative leaning in particular might also root in a psychological compulsion as their meta-analysis showed. In other words, ideology may be seen as an authentic trigger of physiological, behavioural, and psychological traits. Furthermore, when rejecting the inferences of Hibbing, Smith and Alford (2014a), it was especially Jost, Noorbaloochi and van Bavel (2014) who objected whether:

i, "individual differences in brain structure and function bring about divergent ideological preferences"

and/or

ii, "the adoption of specific ideologies leads individuals to think in certain ways, causing our brains to process information differently" (ibid, p317).

By contrast, Hibbing, Smith and Alford (2014a, p303) then concluded that political orientations and leanings are conditioned by *"negatively valenced stimuli"*. Other scholars, however, both appreciated and highlighted the need to elaborate on Hibbing's attempt to shed light on ideological roots in biology and some also particularised the implications of his team's inferences (eg, Cacioppo, Cacioppo, Gollan 2014). Amongst the main critical notes, Federico, Johnson and Lavine (2014, p312) criticised the *"narrow"* character of negativity bias as a concept; Feldman and Huddy (2014) stressed the inconsistency of their findings with those of RWA and SDO that represent two main psychological approaches towards ideological leanings in relation to personality traits (see Roets, van Hiel 2006). Another problem may be seen in subjective perceptions of negativity in the political statecraft (Charney 2014). Hence, as it is palpable, the question of causality directions remains unsettled and thus badly in need of further research and clarifications.

7 EXPERIMENTAL RESEARCH DESIGN[262]

Scientific approaches overlap in this thesis, meaning that qualitative and quantitative methods have been employed as well as a pilot experiment, endorsed by a further execution in statistics. Initially, the research design has been based on a brief survey questionnaire and a neurobiological expertise. Whereas the former is very much traditional in case of political science studies, the latter needs to be clarified and, at the same time, specified in order to deliver a complete data set.

In terms of technology, the main controlling hardware unit responsible for the whole process of measurement, that had been employed, was a fully licensed *BIOPAC MP150* (Biopack Systems, Inc.). Its main specification is, among others, its 16 channel Analog output, making the device one of the most well-known and frequently used in many laboratories around the world.[263] Currently, the MP150 is the second newest device out of the MP Research System line. This hardware is able to record multiple channels for various samples with the speed up to 400 kHz (aggregate). This hardware was then connected to other devices in accordance with its connectivity. These may be, for example, the electrocardiogram (ECG), electrodermal activity (EDA), electromyography (EMG) or respiration data streams (iMotions 2020a).[264]

Apart from its inner *AcqKnowledge* software, subsequently, there were two other salient components, *amplifiers*, connected to the main station in order to acquire the data.[265] First, it was the *EMG 100C*, an electromyography amplifier. As the name suggests, it amplifies muscle electrical activity for both, general and skeletal.[266] Secondly, it was the *GSR 100C*, an amplifier observing the electrodermal activity and skin conductance (EDA), formerly termed as the galvanic skin response (GSR). This

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[262] The data and findings are under a manuscript peer-review procedure as Petlach, Dominik and Ondruška (2020).
[263] Currently in 2020, the model of BIOPAC MP150 has been improved into an enhanced model of BIOPAC MP160 (iMotions 2020b).
[264] Technical specifications of Biopac MP150 are available on the official website (Bipac 2020a).
[265] An overview of facial EMG and EDA may be found in the respective *Subchapter 4.4* on EDX.
[266] Technical specifications of EMG 100C are available on the official website (2020b).

amplifier gauges the skin conductance level (SCL) and skin conductance response (SCR) whilst using a constant voltage of 0.5 V. This amplifier provides both absolute skin conductance data (ie, SCL + SCR) or relative conductance data (SCR).[267]

Figure 33 Biopac MP150; EMG 100C; EDA 100C
Sources: Bipac 2020a; b; c

7.1 Participants

For the purpose of initial test piloting, three extra participants had foregone the other 10 standard participants. In total, there were 10 participants taking part in this pilot experiment. Due to the use and character of physiological data, this number of participants functions as a standard point of reference in the life sciences for pilot studies when using the same or similar tools (see Konicar et al. 2021; Kozel et al. 2004; Wolf et al. 2005; Tamietto, de Gelder 2008).[268] While five participants were students of two prestigious grammar schools (G) in the Olomouc Region, the other five participants were students at secondary vocational schools (S) from the same area. The participants were either randomly selected by their class teachers or selected in the

[267] Technical specifications of GSR 100C are available on the official website (2020c).
[268] As previously declared, the number of participants does not correspond to traditional numbers of participants in social sciences wherein even over 1,000 respondents may partake.

process of chain referral sampling. All the participants declared no history of neurological or psychiatric diseases.

In total, n=10 could be included in the experiment. Among all the participants, there were 5 female participants, ie, 50.00%. All the participants were 18 years old, and thus in accord with the lowest possible level of their coming of age and allowing them to sign the informed consent independently, ie, without any parental approval. In the aftermath of each testing, every participant has received a small bonus of ca £7 (CZK 200.-) in recompense.

7.2 Methods

In the laboratory, they were requested to fill in the online questionnaire form in order to subsequently undergo the investigation process.[269] The participants were then asked to observe a sequence of selected cluster of photographs in which miscellany of politicians appeared. Amongst 30 photographs,[270] 10 portrayed politicians who have favoured democracy and democratic principles, whilst the other 10 embraced non-democratic politicians from the current era and, at the same time, from the past.[271] After displaying every photograph, each participant was requested to indicate how much would they agree with attitudes of showed person.[272] Specifically, each photograph accompanied by the politician's or made-up person's name and surname has been showed for 8 seconds. For this activity, a scale ranging from 1–7 was used as common in other research studies, in this scale, the central number (4) then indicated that the person had not been recognised by the participant. There was, however, another bunch of 10 non-political, meaning strictly neutral, photographs of which

[269] In the course of research, no problematic issues emerged. Neither technical, nor in case of subjects.
[270] In alphabetical order, the following Table 10 brings a list of used politicians in the experiment. Just for illustration, the countries of their dominant control were used in a shortened contemporary terminology, albeit historically inaccurate as in case of Russia for example.
[271] A scheme of photographs may be found in the Appendices.
[272] The order of photographs was always shuffled by the programme, even though there could be always one investigated participant in the lab.

purpose was to serve as a control category in comparison with the previous two groups.

Most importantly, the aim was to focus on dissimilarities in reactions to (and possible preferences for) ideologies, not persons as such. Therefore, names of selected politicians were added as well. In case of neutral photographs, random names were selected.[273]

Afterwards, the findings were taken down through statistics. In this case, though, participants were treated as additional factors, meaning that everyone was affiliated to 30 rows in which 10 represented attitudes towards democratic politicians and 10 photographs were samples of non-democratic representatives, 10 neutral photographs served the control purposes. Albeit less prevalent in statistical analyses of political science, this approach of row multiplying has been standard in psychology and medical statistics. On average, every participant had to spent approximately one hour in the laboratory. In this time, ca 25 minutes for the devices to be installed specifically on the participant,[274] and the research inquiry took ca 25 minutes then.

The aim, however, is not to test any knowledge of these students, ie, whether they are or are not familiar with these people. By contrast, this study's objective is to find similarities in physiological and personal traits in case of preference and inclination towards non-democratic or democratic politicians.

[273] These neutral names were selected by a name generator at https://www.name-generator.org.uk/.
[274] Alongside, the participants were asked to remove metal accessories, such as earrings, necklaces, and piercings, in order to protect them from possible minor electric discharges.

	Non-democratic cluster	*Democratic cluster*
1	Bashar al-Assad (Syria)	Winston Churchill (UK)
2	Nicolae Ceaușescu (Romania)	Mahatma Gandhi (India)
3	Recep T Erdoğan (Turkey)	Václav Havel (Czech Republic)
4	Adolf Hitler (Germany)	John F Kennedy (USA)
5	Saddam Hussein (Iraq)	Martin L King Jr (USA)
6	Vladimir Lenin (Russia)	Nelson Mandela (South Africa)
7	Benito Mussolini (Italy)	Tomáš G Masaryk (Czechoslovakia)
8	Vladimir Putin (Russia)	Angela Merkel (Germany)
9	Joseph Stalin	Barack Obama (USA)
10	Mao Zedong (China)	Justin Trudeau (Canada)

Table 10 Lists of politicians in examined clusters

	Neutral cluster
1	Nathanael Meza (Portugal)
2	Garfield Alston (USA)
3	Calum Wynn (Hog Kong)
4	Tahir Morgan (UK)
5	Finnley Schroeder (Austria)
6	Greyson Castillo (USA)
7	Kiri Paul (Mexico)
8	Carlo Gardiner (Spain)
9	Zakariah Phan (South Africa)
10	Sarah Jaramillo (USA)

Table 11 List of fictitious persons in the neutral cluster

In regard to the questionnaire form,[275] there were 12 questions in total. Five of them were meant to identify the basic characteristics (Questions no 1, 2, 9, 11, and 12) such as the participants' gender, locations of origin, school affiliations, and the social class membership or preferences in music genres, as recently proposed by Devenport and North (2019). A social class identification has always been a truly extraordinary and salient indicator affecting one's behaviour as exemplified not only in the UK (see Baizidi 2019) or in the *World Values Survey* (WVS) question database. Thus, this thesis also wishes to address the topics in the contemporary Czech context, ie, in the aftermath of the end of the Soviet empire whilst using the traditional categorisation ranging from the *working class* to *middle class*, and *upper class* (eg, Durante, Tablante, Fiske 2017; Manstead 2018).[276] Other two batteries of questions (Questions no 5, 6, 7,) stressed political ideology as an indispensable indicator for neuropolitical research drawing upon political behaviour and preferences (Questions no 3, 4, 8, 10). Despite the disputable character of two chief questions differentiating respondents into conservatives and liberals, the overall validity of the core of these questions has also been clarified and confirmed (see Weissflog et al. 2013).

After putting the finishing touches to the research design, this experiment has not been subject to the Institutional Review Board (IRB), nor the Ethical Commission's consent to conduct it,[277] inasmuch as no harm might be expected and especially, no manipulative practice will have been adopted in this experiment.

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[275] A complete version of the questionnaire form may be found in the Appendices.

[276] Though, this classification had to be simplified accordingly as the Czech population has not been fully accustomed to using it as people in the UK, for instance, where the class scale contains many other subgroups, such as middle-middle and upper-upper classes and so forth (see Fox 2004).

[277] The fact is, however, that there are no IRB or ethical commissions at the department, nor faculty level at Palacky University, which may sooner or later become a disputable issue, especially if bearing in mind the official opening of the Cognitive Laboratory. Within the Faculty, an authority body similar to a regular IRB may be found only at Department of Psychology.

7.3 Inevitable modifications

In brief, this chapter aims to encapsulate the main changes and modifications taking place in the course of this experimental investigation so that the research design was enhanced and perfected. Initial steps in respect of practical preparations were taken by the turn of November and December 2019 in order to gain access to necessary laboratory facilities and equipment, amongst which, collaboration with *Department of Psychology, Faculty of Arts, Palacky University* was agreed.[278] Preliminary shapes of the experiments were readied in January 2020 and elaborated on in the following month when the questionnaire, informed consent and three sets of photographs were finished[279] and, at the same time, volunteers from two distinct schools willing to take part were asked around. Finally, the whole experiment could be programmed, timed, encoded and automated in given programmes so that the experiment may proceed smoothly and automatically, meaning without any need to intervene in the course of experimental investigation. The only exception was in case of the time interval before a new photograph could appear. In this case, in was under the baton of researchers to wait long enough until the participant's indicators equilibrated.

7.3.1 Adjustments to the methods

Three initial pilot experiments were conducted in two waves with participants who were all grammar school pupils meeting the age criteria. The first pilot testing was held on 25 February 2020 when two participants took part, the second pilot testing was comprised of one participant, and it was conducted on 2 March 2020. Among these participants, two were female participants and one was a male pupil, and all of them were 18. During and especially in the aftermath of these experiments, deficiencies were

[278] Two departments of *Palacky University* together with the *University Hospital* had been considered and contacted for further debates.
[279] All the photographs were obtained from the free section *of Google.co.uk Images*.

subsequently removed. Some of demerits were rather technical, meaning that the programme background, in which photographs had been placed, was changed from white to darker grey in order to make the screen more pleasant to keep an eye on and similarly, the photographs were enlarged up to the size that its quality remained retained.

Of critical aspects, three cardinal changes were inevitable. First, the number of photographs depicting democratic and non-democratic leaders and neutral persons had to be lowered[280] so that habituation may be avoided sufficiently.[281] Secondly, the order of tasks given to the participants had to be modified accordingly: each photograph was displayed for eight seconds during which the participants were asked to recall and visualise all the information in regard to the person and respective ideology. After showing each photograph, the participants were asked how familiar they were with the person which allowed the examined lines to finish its cycle all the way through.

After answering a simple question *(What can you tell us about this person?)*, a scale ranging between 0 to 2 could be employed in which 0 represented no association and knowledge of the person, 1 stood for basic knowledge, 2 then represented a complete awareness, especially including the person's opinion and ideological background. Afterwards, a scale ranging from 1 to 7 appeared while asking the participants *(How much would you agree with attitudes of this person?)* on their points of view. In this scale 1 stood for *Strongly disagree*, 4 for N/A as the participant was not able to identify the person, and 7 for *Strongly Agree*. Thirdly, in order to assess participants' reactions to diverse ideologies, it was key to make certain that participants would not react to the appearance of selected leaders only but ideology too.[282] For this reason, participants

[280] Originally, there were 15 photographs in each of three categories.
[281] Importantly, habituation as a state signifies a decrease in attention abilities, and it should be eschewed in this type of research.
[282] Reversely, if participants were not familiarised with politicians and neutral persons, other type of research could have been conducted, in its core, this research study would have been investigating mere physiological inclinations. In this case, however, ideology was crucial as an indispensable variable for further understanding of political aspects.

had been emailed a pdf file containing all the 30 photographs and respective legends at least a week beforehand so that they were given enough time to go through.[283]

7.3.2 Testing and the pandemic

The first testing of a regular character took place on 9 and 10 March 2020 with two and then three participants undergoing the investigation. All of them were students attending the secondary vocational school. Among these, three were female pupils and two were male participants. Even though the second part of this experiment examining grammar school pupils had been scheduled on 16 March 2020, it had to be suspended at the last moment. Owing to the outbreak of coronavirus in the Czech Republic and the complete closure of university building across the country, the experiment had to be postponed.

In order to follow the official order of the Czech government, the hygienic conditions had to be tightened in the Laboratory used for this experiment. And hence, the premises were meticulously disinfected after each examination and indeed, chirurgical gloves were changed, respectively when cleansing and peeling the face areas and placing the electrodes. Moreover, a new clause had to be added to the informed consent to emphasise that within the period of experimental investigation, participants will not be wearing any face, chirurgical mask, nor a respirator. A new set of participants from two grammar schools from the area took part on 21st April 2020. Two of them were males, the other three were females.

---

[283] The legend followed the same pattern when stating the country of politician's stint, his or her position (eg, President or PM), and regardless of democratic or non-democratic orientation, one positive plus one negative aspect of his or her rule was always highlighted in a sentence. In case of neutral photographs, the pattern remained unchanged when declaring a country of origin, a job this person held, and finally, a sentence emphasising a neutral characteristic (eg, *He is a keen photographer, specialising in photographs of exotic flowers*.)

8 FINDINGS AND IMPLICATIONS

Before the analysis itself, it is always necessary to process the obtained datasets accordingly. The results recorded by facial electromyography (fEMG) are mostly disrupted by eye movements, such as blinking, which then entail spurious deflections. This frequency noise caused issue may be avoided if the electromyogram is filtered. There are two types of the frequency noise, high or low. And the latter appeared in the recordings of this experiment, too. Whilst the high frequency noise is addressed by the low pass filter, the low frequency noise, by contrast, is fixed by a high pass filtering that allows to remove the lower frequencies, and therefore, the overall recording is smoothed.

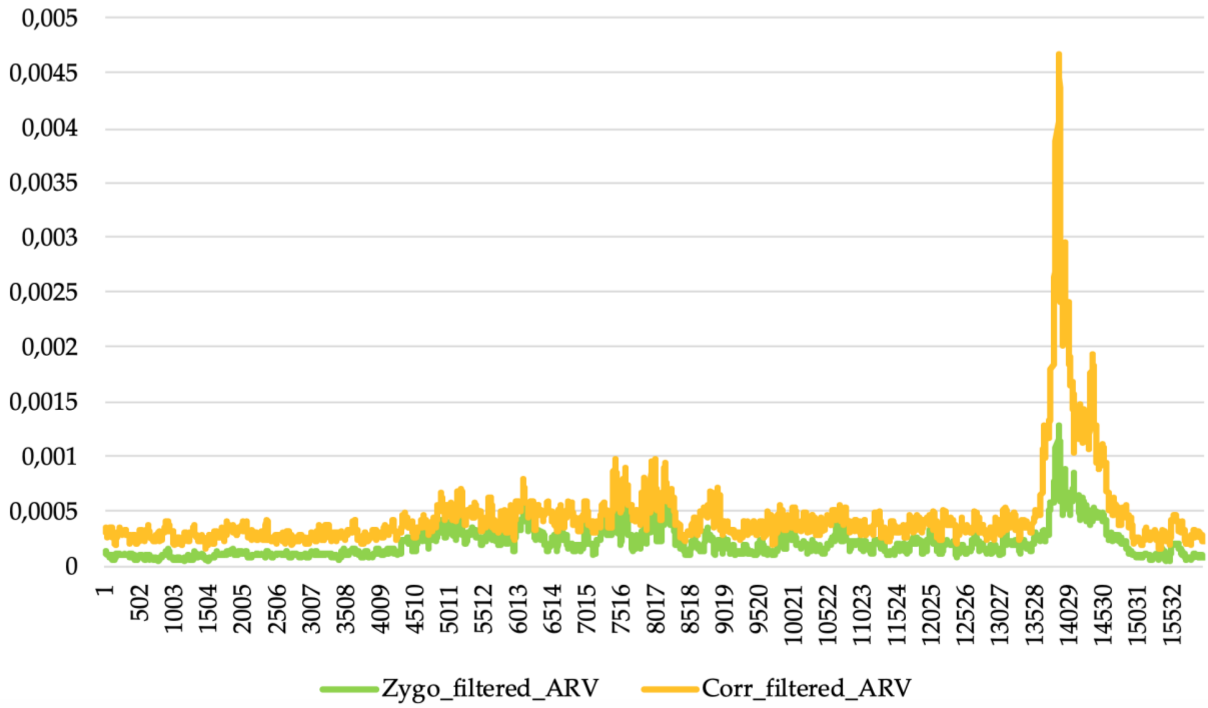


Figure 34 An instance of fEMG recording from the experiment

However, according to van Boxtel (2010, p104), it is essential to employ both of these filters so that the frequency ranges between 20–500 Hz within the *"bandpass"*. This double-ended filter was the first step out of three in the data adjustment. Secondly, the data had to be transferred into absolute values. Every average rectified value (ARV) was achieved after overturning the values from the bottom up. The steps, specifically the third one, of van Boxtel (2010) could not be followed, since otherwise the figures would not be possible to employ as figures for calculations. Thirdly, integrals[284] had to be assigned for each photograph per each participant in order to detach the knoll of activity. An instance of electromyogram is depicted in Figure 34 that specifically shows one participant's reaction to a stimulus. While the green line represents the zygomaticus major responsible for positive reactions, albeit in an often-concealed form, the dark orange colour, reversely, depicts the corrugator supercilii, ie, the facial muscle that is in charge of negative and thus unfavourable reactions. In given situation, the participant exhibited a negative arousal as a reaction to the displayed stimulus.

Electrodermal activity (EDA) and its recordings are largely affected by the heart beats which leads to a negative bias and distortion. First, the low pas filter at 0.05–1 Hz had to be used (see Braithwaite et al. 2015) so that the repetitious waves, in the frequency of one time per 20 s, are supressed.[285] Secondly, it was key to adjust the time slot in the recorded data because electrodermal activity is always 1s delayed. Hence, out of 8 seconds when the photographs had been displayed, the first second had to be excluded in order to commence recording the first actual wave that was causally connected to the displayed photograph. Thirdly, regular SCR are ranging 0.1–1 μS, reactions of the value under 0.1 μS were restrained, since there had been no reflexion of the photograph. Instead, it was a non-specified SCR (NS-SCR). Finally, there were participants whose reactions were vitiated, and thus could not be used for the analysis. It implies that those participants had been pondering upon something different, he or she moved the leg significantly or scratched the face.[286] An instance of one participant's SCR may be seen in Figure 35 where the arousal of SCL is easily visible to the naked eye.

---

[284] Integrals are defined as the sum of area under a curve.

[285] Braithwaite et al. (2015, p7) observed that the regular boundary figure is 0.05 μS.

[286] Factually, in respect of the recording disruption, one participant's SCR could not be used for the analysis because of evident signs of disturbance in the dataset caused by a proximity to devices sending additional signals and thereby damaging the measured figured.

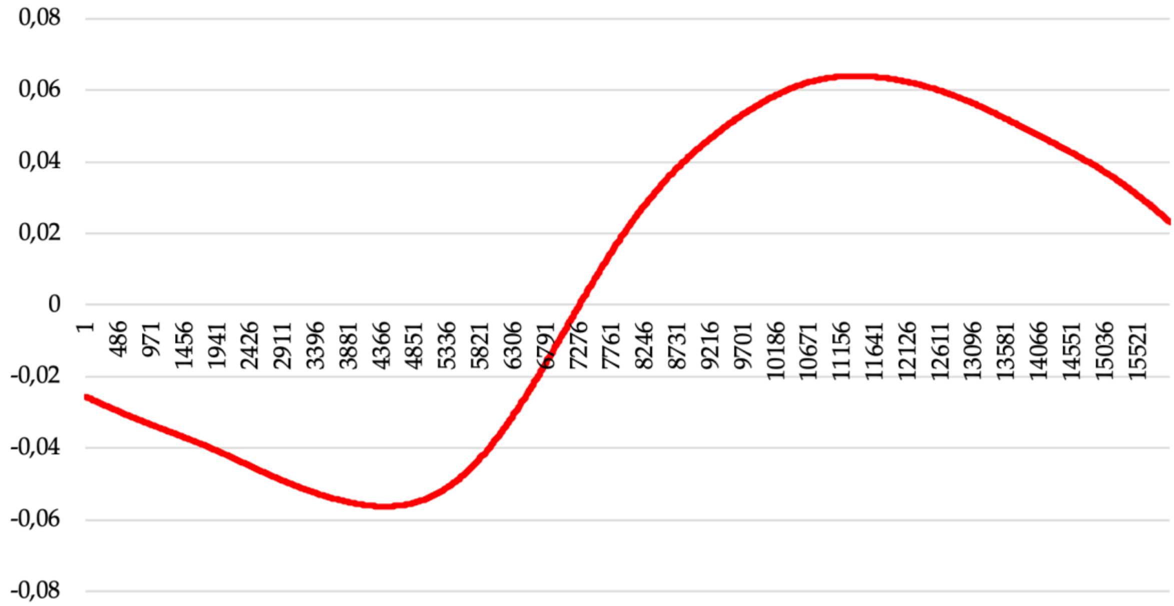


Figure 35 An instance of SCL (0.05-1 Hz) from the experiment

Regarding to the data,[287] the figures underwent the logarithmic calculation in order to acquire a normalisation that was allowed by the fact that no negative numbers appeared after filtering. Consequently, coefficients of linear regression had to experience the same but reversive procedure of logarithms. Furthermore, the data findings in the dataset were not independent because if so, one participant would correspond to one row, and this was not applicable. The examined participants function as *fixed variables*, and therefore it reflects the randomisation effect. For this reason, the most common linear regression could not be used, and it had to be substituted by the *mixed effect model*, calculated in R. By analogy to the *boxplots with jitter* that are meant to pictorialise individual observation in case of SPSS tables, all the R models are then supplemented by its graphical representations using the visualisation of corresponding regression coefficients. This method is also known as the *coefplot* function. Most importantly, although the below-mentioned results operate with and point at the levels of *significance*, the outcomes as a whole are *indicative* as the lower number of participants corresponds to a pilot experiment.

[287] Peak-to-peak figures were obtained too, but owing to a worsened normalisation, filtered ARV figures proved to be fitting.

8.1 Results

Findings of facial electromyography (fEMG) will be the first to come under scrutiny. When considering the zygomaticus major, implying positive reactions, of grammar school pupils versus secondary school pupils towards non-democratic ideology, the statistical significance value of 0.001 was observed whilst employing Levene's test for equality of variances. As depicted in Table 12, it shows that there is a difference in variance between the two examined groups of pupils, however, on average, after running the independent t-test for equality of means, the mean score was 0.587 suggesting no significant difference in reactions towards non-democratic ideology from all the pupils. Overall, it was evidenced and pictorialised in Graph 1 that the zygomaticus major showed no difference amongst investigated pupils when positively responding to non-democratic ideology. When focusing on the spread of data in this graph, it is palpable that the group of grammar school pupils (G) does not differentiate from the secondary vocational school pupils (S) in the distribution, nor in the allocation of outliers. From the course of experimental investigation, it was evident that the same dictators and ideologies, especially in case of B Mussolini, had been appraised similarly, ie, in positive values, among pupils from both types of institutions, even though the pupils had recognised him and his deeds.[288]

Group Statistics

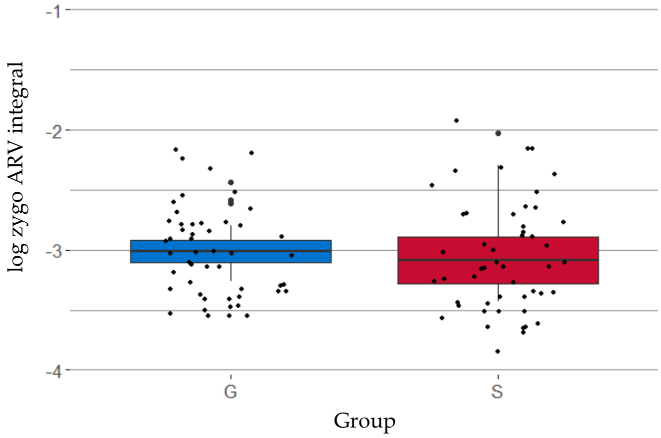
	group_N	N	Means	Std. Deviation	Std. Error Mean
log_zygo_ARV_integral	S	50	-3.01827157	.3234203494	.0457385445
	G	50	-2.98963479	.1826740999	.0258340190

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence of the Difference	
									Lower	Upper
log_zygo_ARV_integral	Equal variances assumed	12.730	.001	-.545	98	.587	-.028636780	.0525300960	-.132881046	.0756074858
	Equal variances not assumed			-.545	77.376	.587	-.028636780	.0525300960	-.133229451	.0759558912

Table 12 Zygomaticus major and non-democratic ideology

[288] Some participants reported that they were not used to associating B Mussolini with any atrocities as in case of A Hitler or others.



Graph 1 Zygomaticus major and non-democratic ideology

In a reversed situation of corrugator supercilii, meaning negative evaluations, and its responses to non-democratic ideology, no difference in variance was observed by Levene's test when the figure of significance value scored 0.424. Yet on average, the t-test[289] adhered to the fact that there was (0.000) a divergence between these two groups. Grammar school pupils (G), as seen in Table 13 and Graph 2, did not exhibit the same negative physiological reaction of corrugator supercilii to non-democratic ideology as the vocational secondary school pupils (S). It means that these two groups begin to grow apart.

Group Statistics

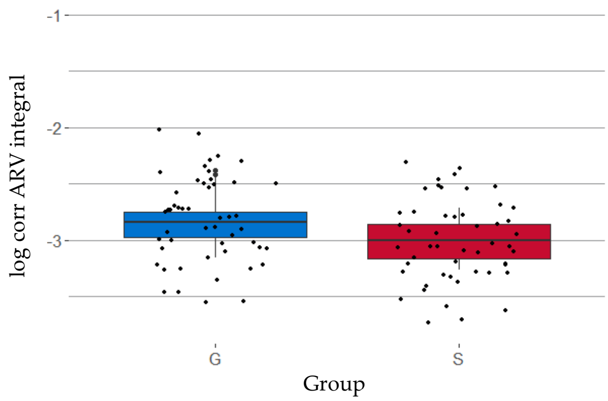
	group_N	N	Means	Std. Deviation	Std. Error Mean
log_corr_ARV_integral	S	50	-3.00896296	.1740453383	.0246137278
	G	50	-2.82935153	.2108729157	.0298219337

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence of the Difference	
									Lower	Upper
log_corr_ARV_integral	Equal variances assumed	.644	.424	-4.645	98	.000	-.179611431	.0386676005	-.256346026	-.102876837
	Equal variances not assumed			-4.645	94.599	.000	-.179611431	.0386676005	-.256380524	-.102842339

Table 13 Corrugator supercilii and non-democratic ideology

289 In this situation, the *repeated measures ANOVA* (2x2 = within-factor democrat/non-democrat x between factor grammar school/vocational school) may be used for operationalisation. The fact is, however, that it would produce the same mathematical results as the other models. And unlike their physical reactions, the cluster effect as well as the participants remain of no determinative importance.



Graph 2 Corrugator supercilii and non-democratic ideology

In respect of democratic ideology and corresponding positive reactions towards it from the two groups of pupils, it is evident that a significant difference appeared in variance and, at the same time, in the figure of average t-test scoring at the level of 0.025. As then depicted in Graph 3, Table 14 supports the claim that democratic ideology elicits a salient disparity in positive reactions.

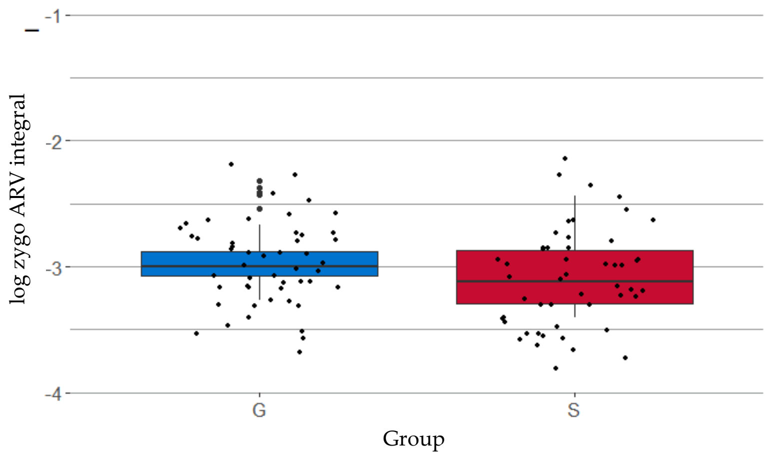
Group Statistics

	group_N	N	Means	Std. Deviation	Std. Error Mean
log_zygo_ARV_integral	S	50	-3.05841883	.2861446182	.0404669600
	G	50	-2.94220425	.2212152851	.0312845656

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence of the Difference	
									Lower	Upper
log_zygo_ARV_integral	Equal variances assumed	4.307	.041	-2.272	98	.025	-.116214576	.0511497693	-.217719629	-.014709524
	Equal variances not assumed			-2.272	92.156	.025	-.116214576	.0511497693	-.217800144	-.014629008

Table 14 Zygomaticus major and democracy



Graph 3 Zygomaticus major and democracy

As displayed in Table 15, negative responses to democracy did not differ greatly in variance as proved by Levane's test, scoring at 0.948, but on the other hand, the t-test showed a significant average difference (0.000) which, as in case of previous situations, endorsed the hypothesis postulating a significant difference between the two groups of pupils. The difference lying in the distinct data distributions may also be seen in Graph 4.

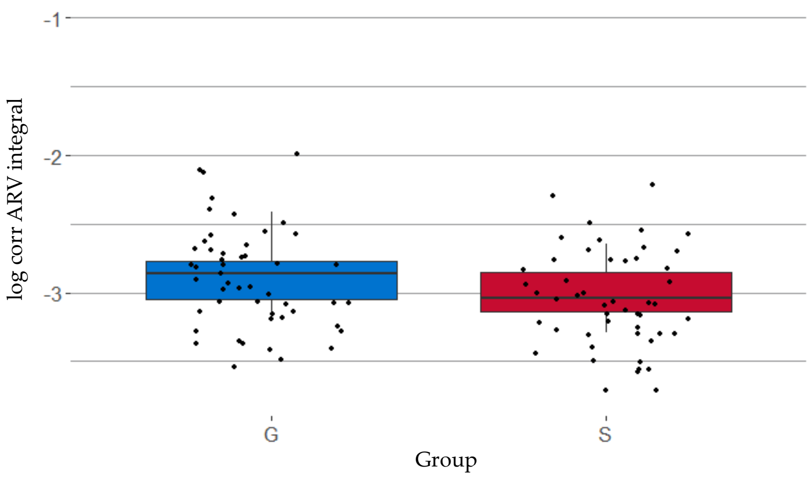
Group Statistics

	group_N	N	Means	Std. Deviation	Std. Error Mean
log_corr_ARV_integral	S	50	-3.00735550	.1859831877	.0263019946
	G	50	-2.86181375	.1961788532	.0277438795

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence of the Difference	
									Lower	Upper
log_corr_ARV_integral	Equal variances assumed	.004	.948	-3.807	98	.000	-.145541749	.0382298021	-.221407547	-.069675951
	Equal variances not assumed			-3.807	97.722	.000	-.145541749	.0382298021	-.221410243	-.069673255

Table 15 Corrugator supercilii and democracy



Graph 4 Corrugator supercilii and democracy

Observed significant physiological distinctions have also been affirmed in terms of the variable of approval within the 1-7 scale. Non-democratic ideology and its politicians had acquired a conspicuously higher approval from the examined secondary school pupils (S), see Table 16 and Graph 5, when appearing with a substantial significance. The approval rate that pertained to democracy, by contrast, was significantly lower amongst these (S) pupils (Table 17 and Graph 6).[290]

Group Statistics

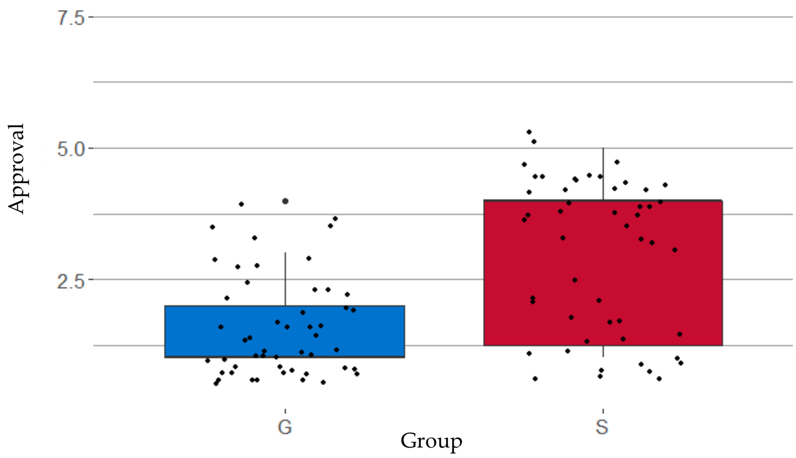
group_N		N	Means	Std. Deviation	Std. Error Mean
approval	S	50	2.94	1.406	.199
	G	50	1.68	.913	.129

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence of the Difference Lower	95% Confidence of the Difference Upper
approval	Equal variances assumed	22.959	.000	5.315	98	.000	1.260	.237	.790	1.730
	Equal variances not assumed			5.315	84.118	.000	1.260	.237	.789	1.731

Table 16 Approval of non-democratic ideology

290 Grammar school pupils accounted for the *Group 2*, while the secondary vocational school pupils constituted the *Group 1*.



Graph 5 Approval of non-democratic ideology

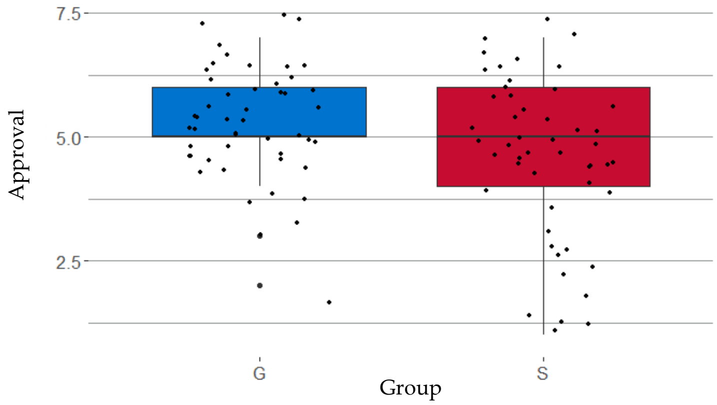
Group Statistics

group_N		N	Means	Std. Deviation	Std. Error Mean
approval	S	50	4.54	1.669	.236
	G	50	5.30	1.093	.155

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence of the Difference Lower	95% Confidence of the Difference Upper
approval	Equal variances assumed	8.057	.006	-2.694	98	.008	-.760	.282	-1.320	-.200
	Equal variances not assumed			-2.694	84.497	.009	-.760	.282	-1.321	-.199

Table 17 Approval of democratic ideology



Graph 6 Approval of democratic ideology

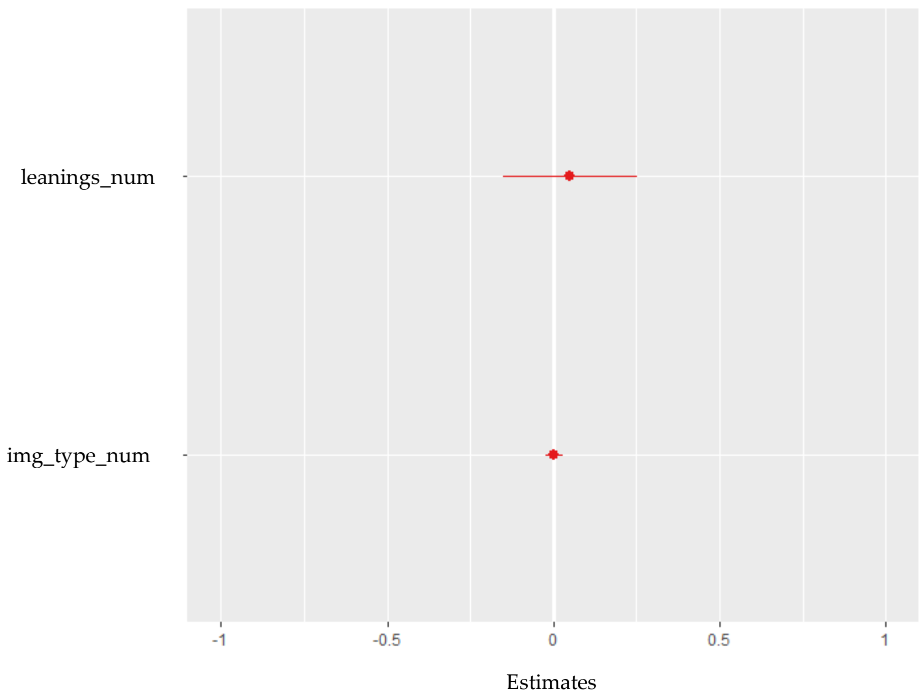
In search for (dis)similarities amongst the participants' ideological leanings, the first striking aspect was that they identified themselves as mostly centrist oriented (70%), while conservatism (10%) and liberalism (20%) were less frequent in participants' answers. Nonetheless, after using the R statistics with the fixed effect model and bearing in mind that the figures scored the t>0.05, no effect of ideological leanings has been verified. In random-effects modelling, by analogy, the large standard deviation (Std.dev) of 0.1717 testifies to the absence of significance regarding the liaison between the zygomaticus major and political leanings, as it was demonstrated in Table 18.[291] In Graph 7, this insignificance proved to be manifest due to its positioning.

```
Linear mixed model fit by REML. t-tests use Satterthwaite's method ['lmerModLmerTest']
Formula: log_zygo_ARV_integral ~ leanings_num + img_type_num + (1 | subject)
   Data: my_data

REML criterion at convergence: -91.3

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.6288 -0.5941 -0.1255  0.4560  4.4264

Random effects:
 Groups   Name        Variance Std.Dev.
 subject  (Intercept) 0.02950  0.1717
 Residual             0.03749  0.1936
Number of obs: 300, groups:  subject, 10

Fixed effects:
              Estimate Std. Error         df t value   Pr(>|t|)
(Intercept)  -3.052708   0.108858   8.259179 -28.043   1.75e-09 ***
leanings_num  0.049386   0.102968   7.999992   0.480      0.644
img_type_num  0.001821   0.013692 289.000003   0.133      0.894
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
            (Intr) lnngs_
leanings_nm -0.851
img_type_nm -0.126  0.000
```

[291] A general summarisation of R models may be found by the end of this chapter.

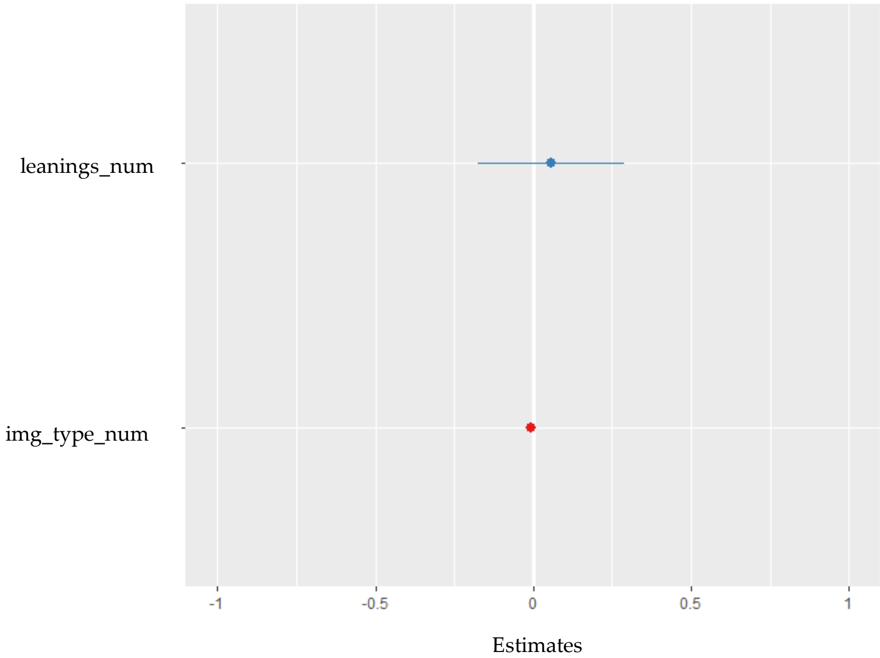
```
ANOVA-like table for random-effects: Single term deletions

Model:
log_zygo_ARV_integral ~ leanings_num + img_type_num + (1 | subject)
             npar  logLik     AIC    LRT Df Pr(>Chisq)
<none>          5  45.647 -81.295
(1 | subject)   4 -14.619  37.238 120.53  1  < 2.2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Table 18 Zygomaticus major and ideological leanings



Graph 7 Zygomaticus major and ideological leanings

After that, Table 19 together with Graph 8 show that connexions between negative reactions, sourcing in the corrugator supercilii, and ideological leanings have not been verified either. In a similar way, the figures of the fixed effect model scored the t>0.05, thus showing no effect as such. And moreover, the Std.dev (0.20079) of random effect signifies the same. Overall, these models exposed that ideological positioning and physiological traits and predispositions represented by the zygomaticus major and corrugator supercilii, do not function in conjunction.[292] Therefore, the outcomes are in line with Kremláček et al. (2019). According to their data and findings, ideological leanings do not represent a variable of the same importance as in case of the West wherein Amodio et al. (20078) had initially conducted their research experiment.



Graph 8 Corrugator supercilii and ideological leanings

```
Linear mixed model fit by REML. t-tests use Satterthwaite's method ['lmerModLmerTest']
Formula: log_corr_ARV_integral ~ leanings_num + img_type_num + (1 | subject)
   Data: my_data

REML criterion at convergence: -524.6

Scaled residuals:
    Min      1Q  Median      3Q     Max
-4.8399 -0.5280  0.0164  0.5806  3.3715

Random effects:
 Groups   Name        Variance Std.Dev.
 subject  (Intercept) 0.040317 0.20079
 Residual             0.008308 0.09115
Number of obs: 300, groups:  subject, 10
```

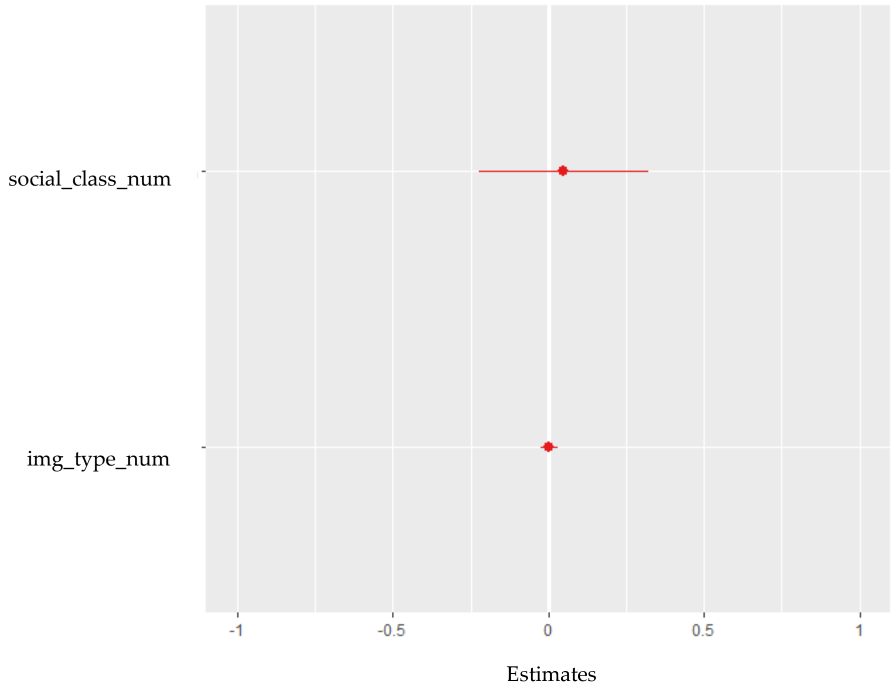
[292] Albeit not presented in the thesis, the pupils, who indicated in the questionnaire that democracy is the best form of government, did share, at any level of significance, no similarities in their physiological traits in respect of given muscles.

```
Fixed effects:
             Estimate Std. Error        df t value Pr(>|t|)
(Intercept)   -2.965659   0.124255   8.043222 -23.868  9.4e-09 ***
leanings_num   0.056948   0.118313   7.999999   0.481    0.643
img_type_num  -0.007714   0.006445 289.000000  -1.197    0.232
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
            (Intr) lnngs_
leanings_nm -0.857
img_type_nm -0.052  0.000
ANOVA-like table for random-effects: Single term deletions

Model:
log_corr_ARV_integral ~ leanings_num + img_type_num + (1 | subject)
             npar  logLik     AIC    LRT Df Pr(>Chisq)
<none>          5 262.280 -514.56
(1 | subject)    4  45.585  -83.17 433.39  1  < 2.2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Table 19 Corrugator supercilii and ideological leanings

Although the participants were perfectly able to categorise themselves within given social classes (80% as middle class and 20% as working class),[293] the fact is that physiological responses, be it those associated with the zygomaticus major or corrugator supercilii, were not mirrored in any class system pattern which would spring up. Regardless of claimed social class affiliations, the R models with the t>0.05 found no statistical significance in the default positive, nor negative responses to ideological stimuli as manifested in Table 20 and 21 and then specifically in the data visualisations in Graph 9 and 10. More than in previous instances with visualisations of R models, the figures in both graphs (9 and 10) appear in a closer proximity to zero and its line showing insignificant function.

[293] It implies that the upper class has not been represented in the experiment.

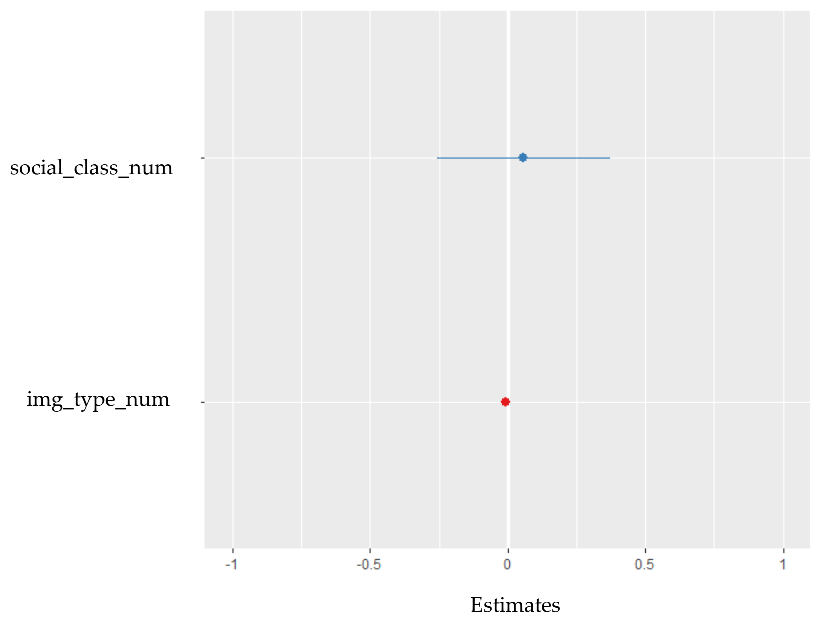


Graph 9 Zygomaticus major and social classes

```
Linear mixed model fit by REML. t-tests use Satterthwaite's method ['lmerModLmerTest']
Formula: log_zygo_ARV_integral ~ working_class_num + img_type_num + (1 |      subject)
   Data: my_data

REML criterion at convergence: -91.8

Scaled residuals:
    Min      1Q  Median      3Q     Max
-2.6301 -0.5923 -0.1225  0.4526  4.4251

Random effects:
 Groups   Name        Variance Std.Dev.
 subject  (Intercept) 0.02991  0.1729
 Residual             0.03749  0.1936
Number of obs: 300, groups:  subject, 10

Fixed effects:
                   Estimate Std. Error         df t value Pr(>|t|)
(Intercept)       -3.095562   0.257689   8.045354 -12.013 2.03e-06 ***
working_class_num  0.048501   0.139554   7.999995   0.348    0.737
img_type_num       0.001821   0.013692 289.000002   0.133    0.894
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
            (Intr) wrkn__
wrkng_clss_ -0.975
img_type_nm -0.053  0.000
```

```
ANOVA-like table for random-effects: Single term deletions

Model:
log_zygo_ARV_integral ~ working_class_num + img_type_num + (1 |
    subject)
              npar  logLik     AIC    LRT Df Pr(>Chisq)
<none>           5  45.891 -81.783
(1 | subject)    4 -15.129  38.258 122.04  1  < 2.2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Table 20 Zygomaticus major and social classes



Graph 10 Corrugator supercilii and social classes

```
Linear mixed model fit by REML. t-tests use Satterthwaite's method ['lmerModLmerTest']
Formula: log_corr_ARV_integral ~ working_class_num + img_type_num + (1 |       subject)
   Data: my_data

REML criterion at convergence: -525.1

Scaled residuals: 
    Min      1Q  Median      3Q     Max 
-4.8447 -0.5273  0.0180  0.5811  3.3710 

Random effects:
 Groups   Name        Variance Std.Dev.
 subject  (Intercept) 0.040831 0.20207 
 Residual             0.008308 0.09115 
Number of obs: 300, groups:  subject, 10

Fixed effects:
                   Estimate Std. Error         df t value Pr(>|t|)    
(Intercept)       -3.017918   0.295629   8.007591 -10.208 7.22e-06 ***
working_class_num  0.057506   0.160289   7.999980   0.359    0.729    
img_type_num      -0.007714   0.006445 289.000006  -1.197    0.232    
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
            (Intr) wrkn__
wrkng_clss_ -0.976       
img_type_nm -0.022  0.000
```

```
ANOVA-like table for random-effects: Single term deletions

Model:
log_corr_ARV_integral ~ working_class_num + img_type_num + (1 | 
    subject)
               npar logLik     AIC    LRT Df Pr(>Chisq)    
<none>            5 262.53 -515.05                         
(1 | subject)     4  44.38  -80.76 436.29  1  < 2.2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Table 21 Corrugator supercilii and social classes

Finally, after using the Kendall and Spearman rank correlation coefficients, it is feasible to observe that the grammar school pupils, especially favouring indie and rock music, are mostly democrats. But in this case, nevertheless, the number of samples was artificially increased due to the fact that each sample was not represented by 1 row but 30 instead, thus 300 in total as showed in Table 21. And for that reason, in comparison to physiological traits, these sociological findings could be misleading. Hence, in this case, in order to obtain the data possessing statistical significance, it would be necessary to capitalise the research study on a greater size of sample.

			music_type	democracy	log_zygo_ARV _integral	log_corr_ARV _integral
Kendall's tau_b	music_type	Correlation Coefficient	1.000	.147**	.000	-.115**
		Sig. (2-tailed)	.	.004	.996	.008
		N	300	300	300	300
	democracy	Correlation Coefficient	.147**	1.000	.250**	.461**
		Sig. (2-tailed)	.004	.	.000	.000
		N	300	300	300	300
	log_zygo_ARV _integral	Correlation Coefficient	.000	.250**	1.000	.328**
		Sig. (2-tailed)	.996	.000	.	.000
		N	300	300	300	300
	log_corr_ARV _integral	Correlation Coefficient	-.115**	.461**	.328**	1.000
		Sig. (2-tailed)	.008	.000	.000	.
		N	300	300	300	300
Spearman's rho	music_type	Correlation Coefficient	1.000	.162**	-.001	-.144*
		Sig. (2-tailed)	.	.005	.989	.012
		N	300	300	300	300
	democracy	Correlation Coefficient	.162**	1.000	.316**	.573**
		Sig. (2-tailed)	.005	.	.000	.000
		N	300	300	300	300
	log_zygo_ARV _integral	Correlation Coefficient	-.001	.316**	1.000	.460**
		Sig. (2-tailed)	.989	.000	.	.000
		N	300	300	300	300
	log_corr_ARV _integral	Correlation Coefficient	-.144*	.573**	.460**	1.000
		Sig. (2-tailed)	.012	.000	.000	.
		N	300	300	300	300

**. Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed)

Table 22 Links to physiology and music

* * *

The skin conductance response (SCR) was the second examined physiological variable. Whilst the aforementioned indicators of fEMG foregrounded some significant differences between the two groups of pupils, when employing the SCR in connexion to non-democratic ideology, the variable did not differ. And thus, the electrodermal activity recorded no unlikeness amongst all the pupils as depicted in Table 23 and Graph 11. Interestingly, in case of non-democratic ideology, the activity of positively perceiving zygomaticus major was expressed identically by the pupils of given groups. Table 24 accentuates the fact that investigated pupils experienced and perceived democracy and respective politicians without any aberrant cases, since for ideology based on democracy, on average, the data of recorded SCR did vindicate no significant divergence between the examined groups of grammar school and secondary school pupils, even though the pupils manifested a greater level of similarity in case on non-democratic ideologies and its politicians than in the instance of democracy (cf, Graph 11 and Graph 12).

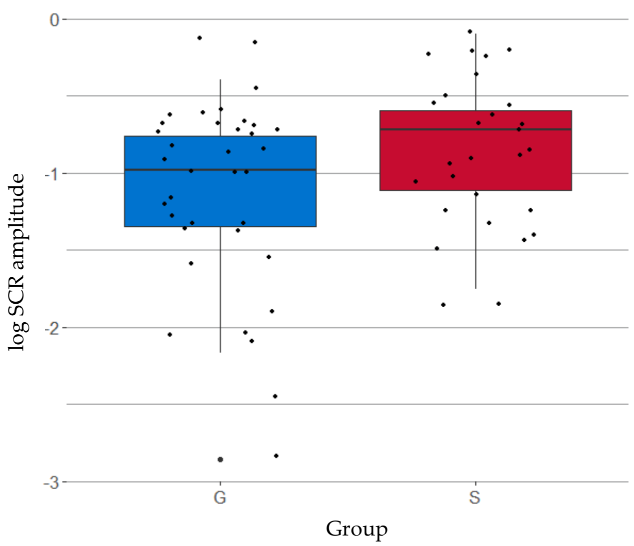
Group Statistics

	group_N	N	Means	Std. Deviation	Std. Error Mean
log_SCR_amplitude	S	36	-.683157325	.4956183765	.0826030627
	G	45	-.830636157	.7696337647	.1147302277

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence of the Difference Lower	95% Confidence of the Difference Upper
log_SCR_amplitude	Equal variances assumed	3.422	.068	.996	79	.322	.1474788325	.1481106859	-.147328113	.4422857784
	Equal variances not assumed			1.043	75.825	.300	.1474788325	.1413728797	-.134100143	.4290578079

Table 23 SCR and non-democratic ideology



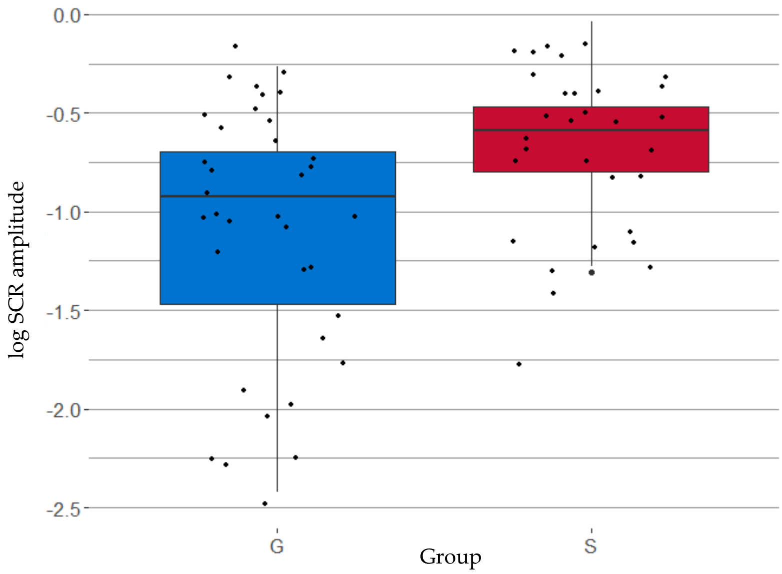
Graph 11 SCR and non-democratic ideology

group_N		N	Means	Std. Deviation	Std. Error Mean
SCR_amplitude (µS)	S	34	.3342764655	.2597623546	.0445488763
	G	45	.4815438096	.7362020934	.1097465284

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence of the Difference	
									Lower	Upper
SCR_amplitude (µS)	Equal variances assumed	17.270	.000	-1.114	77	.269	-.147267344	.1322299863	-.410570886	.1160361973
	Equal variances not assumed			-1.243	57.609	.219	-.147267344	.1184436696	-.384392345	.0898576569

Table 24 SCR and democracy



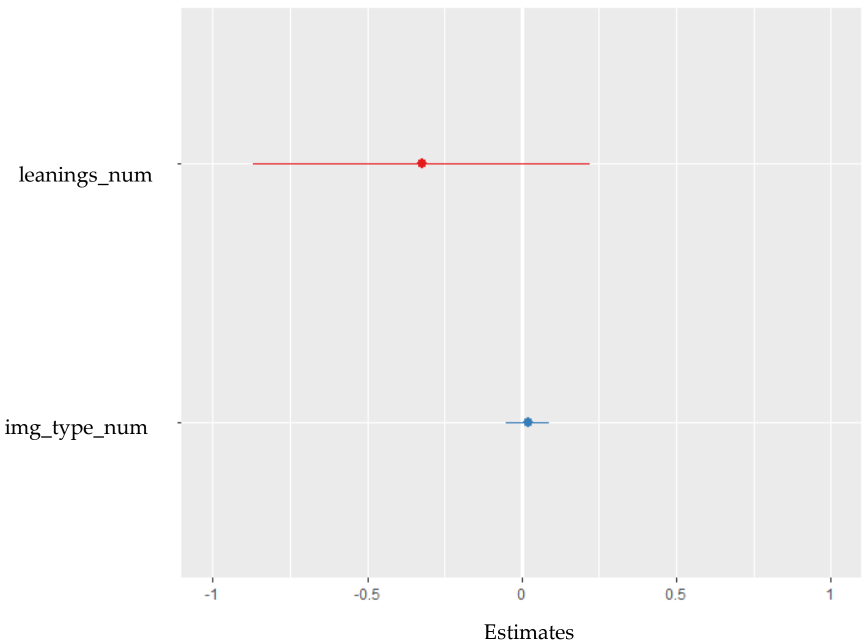
Graph 12 SCR and democracy

The penultimate variable, political leanings, was not verified as a relevant one that would pertain to the SCR. Regardless of the Std.dev, the mixed effect model (Table 25) did not prove any liaison, nor physiological predisposition. The same situation has been exemplified by the presence of no effect in the random and fixed-effect model in Table 26. As depicted in Graph 13 and 14, the figures turned out to be not only in close proximity to the zero-line showing no significance as in the situations of the zygomaticus major and corrugator supercilii, but in SCR, they were also negative and insignificant. On that account, the results of this experiment exposed that the SCR, as a physiological variable, did not mirror in social class affiliation, nor in political leanings, be it conservative or liberal.

```
Linear mixed model fit by REML. t-tests use Satterthwaite's method ['lmerModLmerTest']
Formula: Log_SCR_amplitude ~ leanings_num + img_type_num + (1 | subject)
   Data: my_data

REML criterion at convergence: 333.6

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.5656 -0.4877  0.1347  0.6094  2.0500

Random effects:
 Groups   Name        Variance Std.Dev.
 subject  (Intercept) 0.2160   0.4647
 Residual             0.2056   0.4535
Number of obs: 238, groups:  subject, 9

Fixed effects:
              Estimate Std. Error        df t value Pr(>|t|)
(Intercept)   -0.52191    0.29570   7.21608  -1.765    0.120
leanings_num  -0.32443    0.27836   6.99639  -1.165    0.282
img_type_num   0.01958    0.03589 228.02867   0.545    0.586

Correlation of Fixed Effects:
            (Intr) lnngs_
leanings_nm -0.837
img_type_nm -0.117 -0.003
```

```
ANOVA-like table for random-effects: Single term deletions
Model:
Log_SCR_amplitude ~ leanings_num + img_type_num + (1 | subject)
              npar  logLik    AIC    LRT Df Pr(>Chisq)
<none>           5 -166.78 343.56
(1 | subject)    4 -225.32 458.64 117.08  1  < 2.2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Table 25 SCR and political leanings

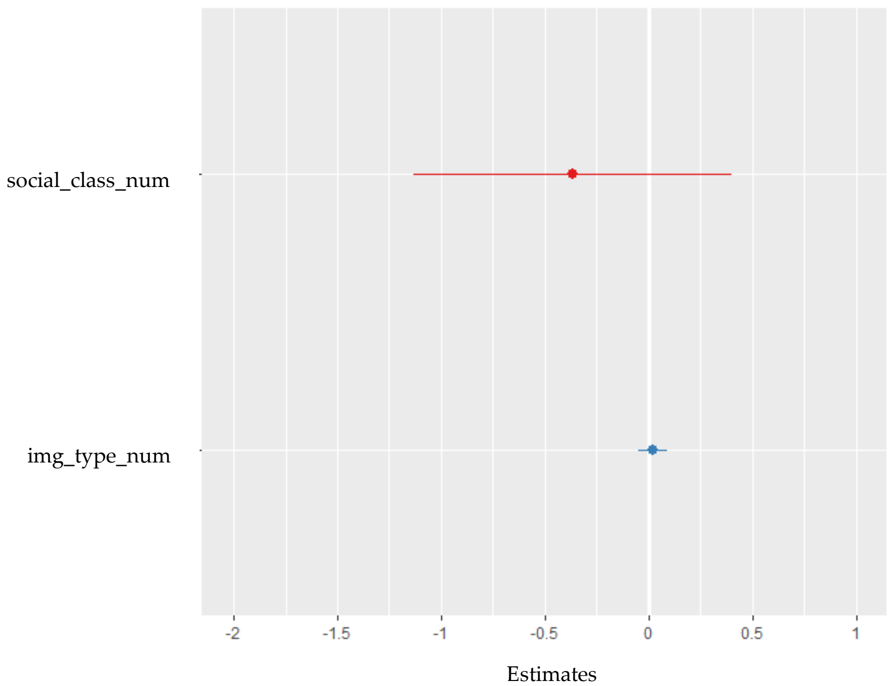


Graph 13 SCR and political leanings

```
Linear mixed model fit by REML. t-tests use Satterthwaite's method ['lmerModLmerTest']
Formula: Log_SCR_amplitude ~ working_class_num + img_type_num + (1 | subject)
   Data: my_data

REML criterion at convergence: 333.3

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.5423 -0.4982  0.1353  0.6278  2.0553

Random effects:
 Groups   Name        Variance Std.Dev.
 subject  (Intercept) 0.2296   0.4792
 Residual             0.2056   0.4535
Number of obs: 238, groups:  subject, 9

Fixed effects:
                  Estimate Std. Error        df t value Pr(>|t|)
(Intercept)       -0.15736    0.71517   7.07909  -0.220    0.832
working_class_num -0.36728    0.39115   7.03842  -0.939    0.379
img_type_num       0.01949    0.03589 228.03804   0.543    0.588

Correlation of Fixed Effects:
            (Intr) wrkn__
wrkng_clss_ -0.973
img_type_nm -0.048 -0.001
```

```
ANOVA-like table for random-effects: Single term deletions

Model:
Log_SCR_amplitude ~ working_class_num + img_type_num + (1 | subject)
            npar  logLik    AIC    LRT Df Pr(>Chisq)
<none>          5 -166.67 343.35
(1 | subject)    4 -229.48 466.97 125.62  1  < 2.2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Table 26 SCR and social classes



Graph 14 SCR and social classes

* * *

Most importantly, however, as shared by the figures across the R models, three stars indicate a significant difference between the two groups. When considering, for instance, the fixed-effect model in case of political leanings (see Table 18), no significance has been verified and thus, the variance in the models could *not* be elucidated by the variable. The intercept figure (1.75×10^{-9}),[294] as well as the figures of

[294] The intercept implies where the *x* and *y* line would intersect without considering the variables.

political leanings (0.644) and the type of displayed image (0.894), as highlighted in green and depicting the fixed effect, exceeded the boundary value of 0.05. The ensuing table and its cardinal value ($2.2x10^{-16}$), circled in yellow, shows the total value of the model for random effects. And by contrast, it did not surpass the 0.05 value.

This situation has occurred in other R models, too. Overall, it implies that, on average, there *is* a difference between these two examined groups of pupils in their physiological reactions to different ideological poles, but given variables, such as political leanings and social class, are not able to explicate the divergence in physiological responses from the zygomaticus major, corrugator supercilii, nor the skin conductance response (SCR). Needless to emphasise that due to the fact that the results are of an indicative character, other variables, such as the party preference and participants' gender, have not testified to be germane indicators in this pilot study.

8.2 Ascertainment and hypotheses

Right before the closing remarks, the aforesaid hypotheses are to be briefly recalled and assessed in the order as addressed in this thesis.

Chapter 1:

- *Were there any substantial U-turns or milestones in research of the mind and body over the periods of time up to this day?*

Four rudimentary periods in this area of research were identified. In each of them, scholars mostly expanded upon the work of Plato and Aristotle whose contributions in respect of politics and physiology have been considered to be the most substantial. Notwithstanding sundry fruitful observations made by T Hobbes, for instance, the dicta of R Descartes caught other scholars' attention most noticeably, since his work had been based on an extreme form of dualism, meaning a strict separation of the human body and mind. The modern liaisons between biological and political disciplines resides in the aftermath of the Second World War and its consequences related to medical discoveries and ethics. Corresponding themes were subsequently elaborated on by M Foucault and the American behaviouralists. Their roots, however, had appeared by the turn of 1920s and 1930s.

Chapter 2:

- *Were there any domains prevailing amongst scholars in former Czechoslovakia and later in the Czech and Slovak Republic, and why?*

Apart from E Rádl, whose work is dated back to the beginnings of the 20th century, three main scientific pillars, were discerned. It was Z Neubauer Jr and L Kováč whose mutual correspondence on biology, biochemistry, and society even brought the Czech Republic nearer to Slovakia in former Czechoslovakia. Currently, there are institutions, under the patronage of universities, of which research endeavours to link biology to social sciences. It is, nonetheless, the overall character or equipment of given departments affecting the research foci. As a consequence, the number of experiments specialising in politics has remained narrow.

Chapter 3:

- *In respect of research foci, where do the cognate fields of PPE differentiate when capitalising on neuroscience?*

Political themes have always been studied alongside philosophy and economics that were also added to the analysis together with law. It was revealed that the longest and most complex relation with neuroscience remains in possession of philosophy. Furthermore, the situation has been exacerbated by the fact that scholars of both disciplines tend to disparage the findings and methods of the rivalling side. Neuroeconomics with the longest connexion to psychology and neuroscience exhibits limited room for innovatory directions when foregrounding the research studies mostly on decision-making processes. After introducing neuropolitics, it was distinguished as the youngest component of neuro-x fields with a great scale of potential and research eventualities. The most relevant obstacle, as this chapter initially outlines, lies in neuroethics.

Chapter 4:

- *Quantify the pros and cons: What problems and opportunities do spring from the most frequently used tools of neuropolitics?*

After delineating experimental political science, a selection of tools was simplified into four categories, those examining cerebral metabolic activity or electric activity, followed by electrodiagnosis, and eye-tracking. All of them were evaluated in accordance with inner complexities in use and research opportunities. In conclusion, it was emphasised that although fMRI and EEG are fitting tools, neuropolitical research may also rely on fEMG and EDA. In addition, practitioners will not have to necessarily be given a very limited number of areas to inquire into.

Chapter 5:

- *In respect of neuroethics, what is the scope of activity wherein its functional problems of existence appear?*

A very discussed topic of frontiers in neuroethics ties medical bioethics and, depending on the latest neuroscientific data, it develops corresponding codes of ethics. Accordingly, bearing in mind the historical roots, three crucial periods of research were identified within which researchers shall adhere to the principles of neuroethics.

Chapter 6:

- *How does the human brain affect political behaviour and leanings specifically?*

The human brain is in charge of every sentiment and thought, and it is no different in case of political behaviour. Pioneering studies were stressed in order to *i,* show the evidence on dissimilarities between liberals and conservatives, and *ii,* highlight the respective obstacles in neuropolitical research which have pertained to the course of experimenting, data interpretation and generalisation biases and conditions.

Chapter 7–8:

- H_1: *The participants exhibit divergent physiological traits in the zygomaticus major, corrugator supercilii or SCR when reacting to non-democratic ideology versus democracy.*

According to the physiological data acquired from fEMG, examined grammar school pupils (G) exhibited distinct responses to democracy and non-democratic ideologies when having the results in line with the expected direction. The only exception, though, appeared in positive physiological responses from the zygomaticus major to non-democratic ideologies in which the pupils of two examined groups did not differ, and thus remaining in a negative direction of results. The SCR, by contrast, did not prove any salient significance.

- H_2: *The participants exhibit divergent physiological traits in the zygomaticus major, corrugator supercilii or SCR in accordance with their ideological leaning.*

The evidence showed no liaison between all the examined physiological variables (ie, the zygomaticus major, corrugator supercilii, and the SCR) and political leanings. Therefore, the null hypothesis has not been vindicated in this instance.

- H_3: *The participants exhibit divergent physiological traits in the zygomaticus major, corrugator supercilii or SCR in accordance with their social class affiliation.*

No significant connexion was verified in the case of the aforesaid physiological variables and examined pupils' social class memberships. As in the H_2, the null hypothesis has not been vindicated either.

* * *

Notwithstanding all the confirmed dissimilarities between the two examined groups of pupils, the findings are in line with Kremláček et al. (2019) who questioned the overall eventuality of application in case of political leanings outside the USA and UK, especially in the area of CEE. And furthermore, even the concept of social classes manifested itself as insufficient evidence. This brings back Kerlinge's contention (1984, p13) when he stated that ideology of conservatism and liberalism was *a priori* solely *"important in the Western world".* Given the era of that text, the question arises on how relevant the variable of ideology could ever be in the East in the near future.

Another arising feature, as also observed in the experiment, is an extensive inclination to political centrism. In defiance of centrism, some students exhibited more or less tendencies to approve certain non-democratic ideologies, albeit without any stronger statistical significance. The question is whether non-democratic or authoritarian predispositions may also be associated with centrist attitudes occurring amongst people in the Czech Republic or other countries in CEE. Lindgren (2012), for instance, pondered upon the existence *"centrist authoritarianism".* His extensive study discovered that, in American politics, those who identified themselves as moderate or even centrist tended to score significantly higher in respective psychological tests implying a greater scale of authoritarian tendencies. By contrast, regular Republicans and Democrats exhibited saliently lower figures.

* * *

Most importantly, though and regardless of the declared significance in the section of *Results*, generalisations may be feasible and realised solely at the level of this pilot experiment, ie, its observation and measurement. In order to appraise the overall level of Czech pupils or even society as a whole, this experiment would need further repetition which would indeed increase the number of participants and thus the universal validity. Therefore, the examined sample of pupils might be enlarged at first, and the scheme of this pilot experiment shall be kept accordingly. Then if the research procedure of this pilot study were repeated in certain time intervals, additional long-term data would be acquired for more comprehensive and diachronic analyses because only these shall vindicate or falsify the existence of differences amongst people and their political leanings, party preferences or even between the groups of men and women in their approach to democracy and non-democratic rule.

9 GENERAL DISCUSSION

Although the findings of previous studies may leave an impression of neuro-x fields as super-powerful and voguish at the same time, the list of limitations one must take into account frequently exceeds the possible assets. Therefore, this chapter's objective is to stress the most striking problems one may found in neuropolitical research as a whole, and afterwards specific limits of this thesis are to be highlighted in order to even deliver a set of suggestions for next neuropolitical studies and experiments which are yet to be conducted, since many traditional issues of politics and political science may finally be proved by rigorous evidence. Even in this so called neurocentury, as Bergstrom and Schall (2014, p9) remark, researchers have not been able to better understand the political mind and if so, it is still *"relatively primitive"*. However, the fact that the human brain has not been fully and sufficiently characterised and described (see Kováč, Neubauer 2019, p264) exemplifies the overall limitations dwelling in neuropolitics. And on the other hand, the existence of neuro-x fields does not indicate that traditional conceptions, such as sovereignty, democracy, and nation would vanish for good, they might only become slightly *"weaker"*, as Esposito (2008, p13) adds.

9.1 Neuro-x fields and its limits

It is apparent that limitations of neuropolitical research persist in two elemental spheres. First, it will be inevitable to connect the worlds of neuroscientists and political scientists on the basis of reciprocal assistance, regardless of their stances, even though [they] *"are not bedfellows, neither are they comrades in arms"* (Cacioppo, Visser, 2003).[295] One must also realise that encouraging these two categories of scholars

[295] According to Jost et al., the liaisons between neuroscientists and social scientists shall be perceived as a *"friendship"* already (2014).

that appear to be rather different, may turn out to be demanding (cf, Callard, Fitzgerald 2015; Fitzgerald, Callard 2015). Nevertheless, the pressure on scientists is expected to keep increasing (see Nature Human Behaviour 2020) and consequently, political science may be weakened from the inside. In comparison to psychology, the number of political scientists who are qualified in (neuro)anatomy remains extensively scanty. Similarly, neuroscience practitioners are not adequately aware of the political context, meaning the historical and social background which may potentially affect the research project and its outcomes (Clark-Polner, Clark 2014). At the same time, taking this into account, new university courses might be in great demand thanks to the usability of neuroscience and the fact that neuro-x fields have becoming all the rage. Lectures of politics and other types of social science are currently lacking in experience with neuroscience inasmuch as a new generation of political neuroscientists will have to be born first (cf, Chiao et al. 2013; Petlach 2019a). There is a persisting tendency to simplify the physiological and neuroanatomical theory in non-clinical literature (eg, Zurawicki 2010) which then results in misleading expectations what neuroscience and neuromarketing are able to achieve. It exemplifies the need to educate and train political and social scientists in neuroscience, neuroanatomy, and the use and understanding how the tools should be employed properly in order to deliver the results and findings that may be interpreted accordingly (see also Illes 2009).

Yet, there are many manifold issues undermining neuropolitics, be it of a more or less grave importance, and many obstacles may be drawn from one another. Initially, any neuroscientific research is desperately in need of a fully equipped laboratory with a complete selection of devices, and afterwards, resources may be additionally affected if special medical pundits are to be present and assist with the course of experiments or data analyses. In general, the financial support and resources play a salient role because the neurotechnological equipment is costly for independent researchers. A serious number of studies was conducted as experimental studies on the sample of university and/or any other group of students. And not just because of the financial aspect. As previously mentioned, it is questionable whether students in their youth always necessarily represent a credible sample,[296] especially if one considers a conservative shift and aging as a process with corresponding changes in attitudes. Notwithstanding the deep-rooted practice of students as experiment samples, it may come under scrutiny once again, inasmuch as it is a group of people to attract quickly to the stimuli imposing and the one to be influenced quickly by the stimuli.

The moral and ethical questions, as discussed in *Chapter 5*, are another troubling aspect (see also Glannon 2006; Glannon 2007; Ille, Sahakian 2011), since it is obvious that neuropolitics could be misused in large measure if not under control. Though, how far may these controls go? Does it go hand in hand with independent research, and if it, therefore, aims at common good, which was one of the goals and outcomes of the French Revolution, may one consider neuropolitics beneficial after all? And one shall ask how far any research may proceed to remain in accord with the *Declaration of Helsinki*, previously based on the *Nuremberg Code* from 1947 (La Vaque 2001). This document, of which goals should be referring to a *"collective responsibility"* (Goodyear, Krleza-Jeric and Lemmens 2007, p625), has undergone several modifications already. And yet, it is the most influential document in the area, albeit not binding.

In this vicious circle, not merely the above-mentioned observations may be elaborated on, but practical aspects of methodology shall be discussed forthwith because without having solved the primary methodology of political science (Matusall et al. 2011), moving towards a new scientific neurobiological world would be to no avail. Furthermore, as evident from the past, even experienced neuroscientists may struggle with delivering correct interpretations of research findings. And the overall level of development in case of neuroscience is questionable too (see de Vos, Pluth 2016).

Hence, it may be disputable whether political science has attained maturity to start off as neuropolitics. And this also applies to other social sciences and law. Last

[296] At the same time, the type of tools used in the experiment represents an important indicator.

but not least, one must ponder upon the future and borders delineating how far the neuroscientific research may go without being directly politicised (Scheufele 2018). The impact of neuroscience on social, legal, and political aspects may be substantial, indeed, and unacceptable to the public due to the proximity to mind-reading and other types of misuse in the form of indoctrination in education, creed, and the media (Illes, 2006; Levy 2007). And indeed, it brings back Foucault's hypotheses stressing the fact that sooner or later, biopolitics, in his interpretation, might go adrift and become untameable, not merely in the course of thinking, but also for the ensuing deeds and behaviour as such too (Liesen, Walsh 2012). Alongside, limits may be divided into two basic categories in accordance with the main factor taking place in the research, and hereat one may distinguish *technical* and *human* factors. As summarised (cf, Slanevskaya 2012; Tingley 2006), there are at least six overlapping obstacles (see also Kotchoubey et al. 2016) making neuropolitical research so gruelling and difficult:

- *i,* For any analysis, there is no sufficient impartiality amongst researchers, and thus neutral execution is always unreachable for political affairs, in particular.
- *ii,* In case of cooperation, prejudice and political leanings and political attitudes as such may affect the preparations and subsequently, it may affect the final form and outcomes of investigations.
- *iii,* Despite increased opportunities residing in the tools of neuroscience, the tools still represent an implicit obstacle *per se*.
- *iv,* Scan images, as acquired by neuroscience pundits, may be interpreted differently due to the absence of theoretical framework and the consecutive lack of clarity in functioning neuroscientists would have agreed.
- *v,* On the whole, experimental investigations cannot substitute everyday reality. Having said that, behaviour may be manifesting itself divergently.
- *vi,* And finally, the human brain is, notwithstanding its extraordinary character, so intricate, complicated and interconnected that making blunders might be anticipated even among scholars who are keen on examining this organ. And from certain angles, the human brain may remain unfathomable for yonks.

9.2 The limits of this thesis

Being mindful of the qualitative character of the opening case study on neurobiological underpinnings of politics, selected periods of time and scholars represented only the most striking attitudes. Given scholars and their work could have been examined in greater detail and whilst using more of primary sources, too. However, the final length of this thesis would diametrically accrete, and at the same time, this excessive extent would have been less geared towards neuroscience and physiology. Since the modern era beginning by the 19th century, the number of papers and books has been on the increase, meaning that less room could be devoted to many theorists, which escalated by the turn of the 2000s, as exemplified in the thesis as well. It implies, however, that inconstant and shifting attitudes towards biological foundations of human and political behaviour in the course of time might be consistently examined from philosophical and even medical facet in the near future.

Even though using photographs as in this pilot study is standard in analyses of neuroscience, selecting appropriate photographs of democratic and non-democratic leaders is another aspect the thesis might be criticised for. Not only in the past, but many authoritarian politicians have held different posts within each political regime. For instance, Prime Ministers (PM), Presidents, or Party General Secretaries as in the Union of Soviet Socialist Republics (USSR). This discrepancy has been intensified due to the contemporaneous perception of especially non-democratic leaders. In Portugal, for instance, the former PM, António de Oliveira Salazar is considered to be a prototype of authoritarian leader. His rather successful attempts to improve the economic situation in the country has brought him victory in Portugal's poll on the *Greatest Portuguese (Os Grandes Portugueses)*.[297] Similarly, the Russian-based opinion

[297] In the original BBC version of this poll programme *(100 Greatest Britons)*, Winston Churchill achieved victory with a very similar figure as did the Portuguese PM afterwards.

polls look with favour upon Vladimir Putin, the current Russian president, albeit in an official rendition.

In the experimental investigation, photographs depicting politicians will always be *ab intra* questionable, since a mere demarcation line between the *good and bad chaps* will have never been perfectly outlined. And not to mention the fact that, in this study, some photographs were black and white, whilst the other half remained in colour. This, however, may be seen as a suggestion of another research feature that might be inquired. Furthermore, there are many people in politics whose acts may be disputable and thus ambiguous as, for example, Winston Churchill. Similarly, Aung San Suu Kyi, a political leader in Burma, is another apposite instance. In spite of the Nobel Peace Prize, she has been accused and interrogated by the *International Court of Justice* (ICJ) in The Hague because of genocide crimes against the Rohingya people by the end of the 2010s (Parry 2019). Whereas some infamous authoritarian leaders are known for their deeds, the contemporary politicians who are in office could modify own political directions and therefore, turn more authoritarian. By analogy, the issue of populism, and its intensity, that has become all the rage lately, cannot be sufficiently measured either.

Certainly, showing more locally based politicians would make sense at first glance, the fact is, however, that focusing primarily or exclusively on Czech and/or other Eastern European politicians would be schematic and shallow. By contrast, the objective was to seek for concealed physiological traits, and hereat even less-known politicians had to be used as independent variables. The fact that fEMG and EDA have been employed in order to analyse the predispositions could not solve other knotty issues, especially the difficulty recognising the incompatibility of [political] *reactions* and *behaviour* as demonstrated by Phelps and Thomas (2003). Whereas the former is a limited interval affected by stimuli, the latter stands for long-term manners of actions.

Ultimately, omitting some tools, such as fMRI and EEG, shall prove, on the one hand, to be a defensive trajectory in order to avoid significant financial costs and to keep the biological element in social science.[298] On the other hand, if even one of the aforementioned were employed in the experimental investigation, physiological predispositions would be validated from a different angle.[299] This, however, heads towards the possibilities of future research.

Last but certainly not least, it is crucial to emphasise once again that primarily the results of this study shall be interpreted and understood at the level of this observation in the first place, and thus seen as strictly *indicative*. Its universalisation for the whole population of Czech pupils or citizens would have to be supported by another experiment and further evidence. And consequently, this study has not been able to address the very underlying question asking simply *why?* Be it in the strains of physiology of society. Why did the participants behave this way? Why did participants regard B Mussolini so differently in comparison to A Hitler or other dictators? Where could one find the activity triggers within the human brain? And in reverse, since this or that situation could be observed and measured, which conditions and principles (eg, sundry family issues, social status, area of origin, etc) had affected the participants' behaviour traits? Many aspects shall then be expanded on in qualitative studies which shall connect the physiological side to the social one.

9.3 Further research

When bearing in mind this experiment, there are two fundamental routes for further research.[300] First, studies may draw a lesson from the character of research as presented in this thesis and then ameliorate the above-mentioned limiting factors. Secondly, researchers may elaborate on aspects of

[298] Owing to the need to simplify biological and neuroanatomic information, any of author's potential inaccuracies are unintentional blunders for which he assumes responsibility.
[299] Yet, according to the latest study in *Neuroethics*, neuroimaging also lacks the capability to identify one's sanity (cf, Vitacco et al. 2020).
[300] Alternative and expanding suggestions for solely clinical research are not pondered upon whilst only non-clinical research within neuropolitics will be propounded in this subchapter.

neuropolitics into new directions. However, it is vital to realise that neuropolitics not only builds on experience, since two categories of research studies are identified, *primary* and *secondary* research. Neuropolitics, as part of life sciences, inquires the variables from the scratch, meaning that the previously and widely assumed and expected issues, such as the personality traits in connexion to ideology and democracy, have to be verified as well because these primary themes had been omitted and neglected in research from the biological and physiological perspective. Secondary and therefore extended research studies improve and are based on the primary reports. As a consequence, these advanced studies add new specifics within less explored areas. In this case of personality traits, for instance, participants' avocations, preference in respect of music genres or even cuisines may be examined as well.

At the same time, further research is needed in the area of political philosophy in regard to biopolitics and neuropolitics. For modern political science, be it in the form of biopolitics or neuropolitics, it will be crucial to step out of the line in order to utilise the data and findings for everyday life situations (cf, eg, Fassin 2006; Pérez-Zafrilla 2018). More specifically in neuroscience though, studies may immerse in cerebral metabolic or electric activity dissimilarities. Reversely to this thesis and its focal point stressing ideology as a crucial and principal indicator for neuropolitics, following studies might consider sundry physiological traits drawing voters' attention to dictators, which consequently causes their favouring preferences towards non-democratic regimes.

In the concrete, this experiment may be repeated on a long-term basis so that differences and a possible conservative shift could be observed and studied. By contrast, however, one may use a different type of photographs which would not be based on the faces of politicians, dictators, and democrats but instead photographs would be depicting the outcome of their rule. For instance, photographs of concentrations camps and its practices could also become apposite in order to better understand the fascination concealed behind extremism. The coincident problem, though, will have been located in many neuroethical queries emerging from within.

And similarly, political neuromarketing practitioners might focus on the OCEAN patterns, known as the Big Five, in order to better understand the needs and political preferences of voters (Koukolík 2012, pp46–47). In primary studies, researchers might also employ EEG and fMRI as two suitable and rather prominent tools (Sharma 2011, p1752) to analyse the political mind and its tendencies to incline to democracy and non-democracy as forms of governance. Specifically, members of selected groups as neo-Nazis, extreme left and extreme right supporters, democratic and *less* democratic politicians themselves,[301] and even prison's inmates may be examined one day, too. In defiance of some pioneering analyses (eg, Hare 2011; Dutton 2012; Haycock 2015; Haycock 2019; Shaw 2019) in this specialised research,[302] however, the feasibility problems are straightforward, since these people, as potential experiment participants, will decline an invitation to take part in experiments most definitely, and obviously, the neuroethical issues make complete the problematic nature.

Up to now the only but substantial work in this area has been published by Sajous-Turner et al. (2019). In their research experiment, they had the total of n=808 inmates of which 203 had committed the crimes of homicide, while 605 had committed other crimes which were of different character. According to that analysis, and as depicted in the scan image as Figure 37, homicide offenders were associated with a significantly lower amount of grey matter in certain areas that were highlighted in green/blue.[303] However, as in other mentioned cases, it is not palpable whether the greater or smaller amount of grey matter functions as an initiator of killing. In other

[301] An extraordinary exception may be spotted in the case of V I Lenin whose brain had been put under scrutiny (see Adrianov et al. 1993; Gregory 2008, pp24–35).

[302] In his books, Haycock, an American scientist who had originally focused on neuropharmacology, first (2015) concentrated on imprisoned inmates with psychopathological disorders, their lack in empathy, and then he worked up his hypotheses in the political milieu (2019), when studying the instances of tyrannical dictators, such as Adolf Hitler, Mao Zedong, and Muammar Gaddafi.

[303] These areas were as follows: ventromedial (vmPFC) /orbitofrontal cortex (OFC), anterior temporal cortex, ventrolateral and dlPFC, dorsomedial prefrontal cortex, insula, cerebellum, dorsal anterior cingulate, mid-cingulate, and posterior cingulate cortex extending into the precuneus and superior parietal regions (Sajous-Turner et al 2019, p5).

words, the causal direction and conditionality have not been unravelled yet. Shaw (2019, p263), however, claims in her latest study that Evil is universal and applicable to everyone when concluding that *"all brains are a bit sadistic"*.

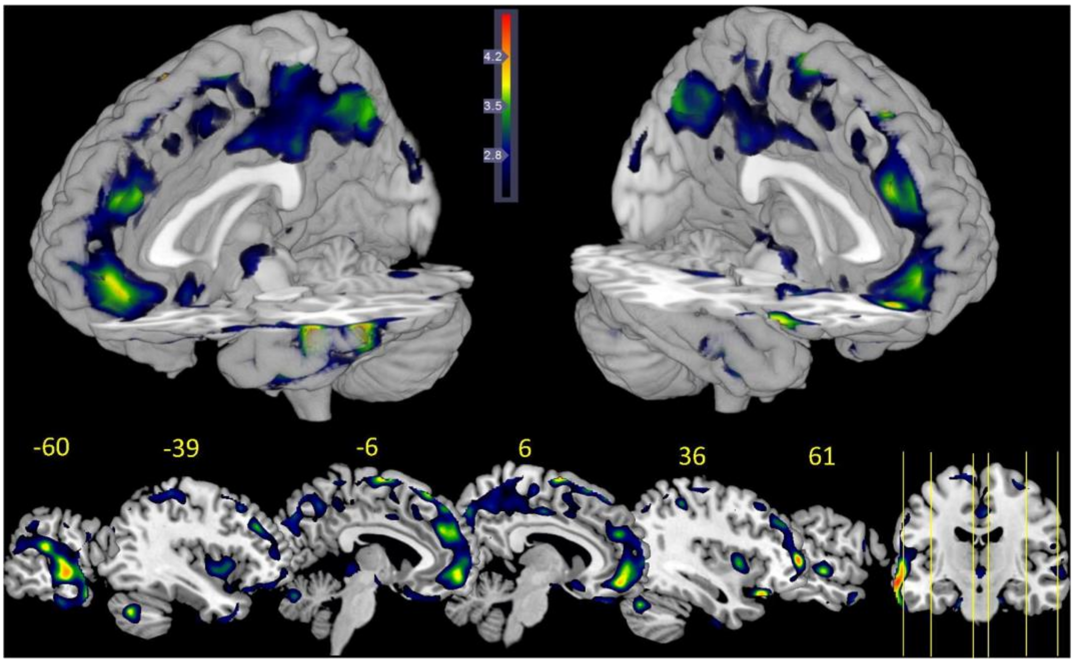


Figure 36 Brain scan images of homicide offenders
Source: Sajous-Turner et al. 2019, p5

In non-clinical research, economy-based activity tasks have been used frequently (see Koukolík 2012, pp233–282), such as the *Dictator game*.[304] But notwithstanding its advantages and simplicity, it cannot substitute the actual members of the aforementioned groups as they may symbolise brand-new opportunities for scientific discoveries. Similarly, as outlined by Jost and Amodio (2012), neuropolitical topics, such as political leanings and authoritarianisms, should be examined with a greater amount of interconnectedness together with religion, since both politics and creeds share demonstrable similarities (see Bouchard 2009; Roets, van Hiel 2006; Kováč 2010).

[304] The dictator game *a priori* measures trustworthiness and willingness to impose an equality in an economic conception and subsequently, this game was modified for further research purposes (eg, Kagel, Roth 2015, pp244–247; pp515–519).

In the general context of Europe, new studies should specialise in emotions, inasmuch as emotions as a general researched problem had been neglected for a long time, especially in comparison to the USA (Schreiber 2017). For neuropolitical research then, emotions play a crucial role in human thinking (Kováč 2019b), and thus decision-making processes, and [emotions] *"interacts (взаимодействует) with the brain neurobiology and social environment"* (Slanevskaya 2012). Afterwards, physiobiological reactions may be contextualised within frameworks and applied in neuromarketing. In a top-down view, a *multimodal approach* may be employed when inquiring candidates and political leaders together with their behaviour in different campaign stages (Stewart, Bucy, Mehu 2015). Bottom-up oriented studies should take into consideration the most omitted group consisting of the neutral, meaning centrist, politicians and voters who are known as political independents in the USA. Nonetheless, the number of centrist voters and politicians is rather poor in quantity in the USA, which has encouraged the scholars to pay attention to the right and left leanings instead (see Gries 2014). Last but definitely not least, it is crucial to address the *"chicken-and-egg"* issue that Jost, Noorbaloochi and van Bavel (2014, p317) view as the *"top-priority"* in contemporary neuropolitics. Hence, upcoming studies and experimental investigations shall also take into account that ideology might be a primordial trigger of physiological and psychological patterns; and for that reason, researchers should consider this reversed connexion, too.

Particularly in the context of Eastern Europe, neuropolitical studies on centrist voters and politicians could become salutary because the party systems are more fragmented in this area (Rovny 2015). In addition, electoral support maintains instable and, by contrast, electoral volatility is extensive, which may be mirrored in a higher number of swing regions and areas (Gherghina 2017, p63), than in case of Western Europe and the USA. Overall, voters in the Czech Republic and other countries of Eastern Europe do not identify themselves so strictly on the left-right scale, and more importantly, their level of party identification, albeit in existence, is not very high, either (Flacco 2014)[305] For that reason, it would be feasible to expand upon already acknowledged human necessity of hierarchy, a concept that has been verified and evidenced in the brain scan (Zink et al. 2008, Figure 37) and could possibly be applied in CEE. Similar to the findings of Zink et al., Ferguson (2017), a Scottish historian, has had a new book issued wherein he attempted to look back at sundry events of the past, in comparison to the contemporary *online society*. He found that no true changes have taken place, and societies across the world are always seeking a system of stability embodies in a hierarchical structure (see also Koski, Xie, Olson 2015).

Overall, focusing strictly on the Czech case, and thus using solely photographs of local politicians, may not be proved groundless. As a consequence, the conspicuous level of political apathy and malaise, persisting in the area (see Lebedová 2014), could be elucidated. Finally, women as a certain group might be taken into account in respect of their conservative and/or liberal shift, since women living in the area tend to be more liberal and left leaning than conservative (cf, eg, Ferge 1997; Regulska 2006). And therefore, additional experiments might work up this theme interestingly.

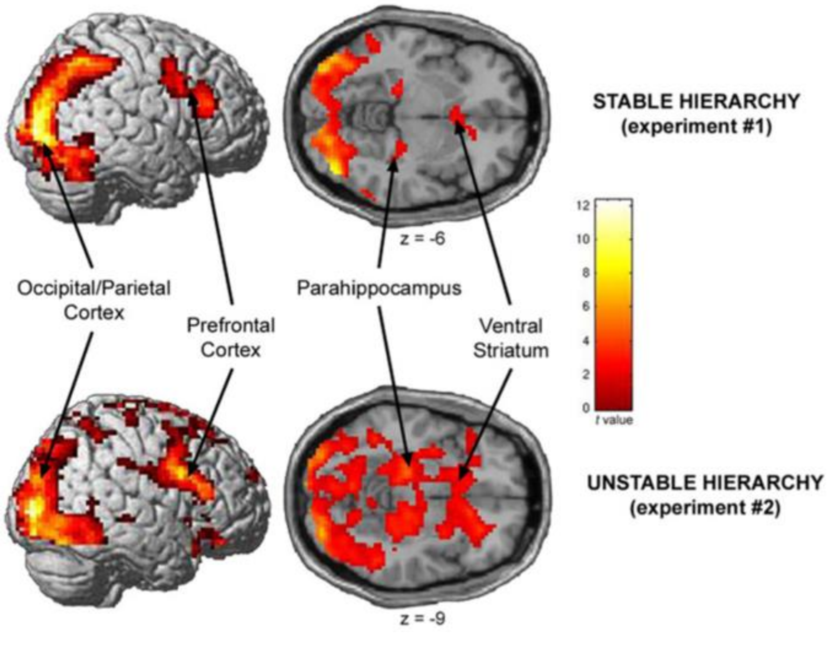


Figure 37 The need of social hierarchy in brain scan images
Source: Zink et al. 2008, p16 / Supplement

[305] This variable has been proved comparable with countries of the West (Rudi 2006).

CONCLUSION

Quelling the doubtfulness and mixed reactions to the connexion between neuroscience and social sciences, this thesis endeavoured to vindicate the magnitude of neuroscience and physiological traits in political research. Hence, the objective of this thesis was to introduce and expand upon the core and application possibilities in this newly arising neuro-x field of neuropolitics.

Chronologically, four periods were delineated in the first chapter in order to foreground the main milestones and scholars whose theories have influenced other theorists in following decades or centuries. Plato and Aristotle might be seen as the pioneering scholars who had studied both philosophy and politically oriented themes and, at the same time, physiological processes affecting human behaviour. Even though Plato's work was less elaborated in respect of methodology, his dicta had been analysed and followed by theorists in a significantly greater depth in the mediaeval times due to the theory of dualism which was subsequently reflected in Christianity. In analogy, although T Hobbes had considered the biological aspect of human behaviour in a rigorous way, it was R Descartes who had been praised and criticised indeed, since his theory of dualism was the most revolutionary by that time. According to Descartes, the body and mind are two separate units and therefore, these two shall be treated accordingly, meaning in a strictly sequestered manner. After that, German idealists, another influential group, consisted of I Kant, G W F Hegel, and J G Fichte, for instance. It was especially Kant's work which has remained influential in regard to medical bioethics and contemporary neuroethics. His work put an accent on the categorical imperative which has been worked up to queries on how people might be used as a means. The 1920s and 1930s were salient decades, since new medical discoveries on the human brain were made. And consequently, in Germany, these attempts to better understand the human body and mind were mirrored in experiments conducted by the Nazi physicians. After having revealed all the committed atrocities in the aftermath of the Second World War, this horrifying experience was indispensable for the practitioners of that time who redrew the existing codes of ethics. When pondering upon the use of power, M Foucault was then the first one to extricate from the negative perceptions of medicine being abused for political doctrines and ideologies. Gradually, behaviouralist studies emerged more frequently, albeit in a limited number and mostly in the USA. Lately, though, neuropolitical topics have been on the upgrade in many developing countries. As it was also demonstrated that in these countries, there are many technical issues scholars have to and/or will have to face regarding either the facilities equipment or education and medical training. Sundry institutions and scholars originally from the area of the Czech Republic and Slovakia were found. Previously, theorists had been specialising in manifold aspects of research and their papers and books displayed overlapping topics and methods more noticeably. Amongst all the stated examples, Zdeněk Neubauer Jr and Ladislav Kováč have represented scholars of biological and biochemical background whose concerns went beyond; and thus in order to elucidate some processes in biology, they employed societal terminology and *vice versa*. In addition, their correspondence, which ended in the 1990s, had been imbued with enthusiasm towards human behaviour and politics. Nowadays, there are local research institutions that link biological and physiological aspects to phenomena of social sciences. Their narrow research foci, however, do not allow them to concentrate on deeper behavioural pattern. And on top of that, political matters still lag behind, since it is mostly religion and decision-making being analysed and inquired in experimental studies.

* * *

Owing to the interdisciplinary character of political science itself, however, the objectives of neuropolitics go even deeper, and it connects manifold themes of politics to physiological, psychological, and genetic traits. At first, three related fields were introduced in terms of main research aims and findings. *Neurophilosophy*, regardless of the greatest connexion to neuroethics, nonetheless, proved to be the least inclined to neuroscience and any cooperation possibilities. It is also neuroscience taking a dislike to philosophy. *Neuroeconomics,* by contrast, showed the highest level of endorsement after having the longest experience in cooperation with psychology. As a neuro-x field, neuroeconomics, nonetheless, mostly focuses on the process of decision-making. The third neuro-x field, *neurolaw*, has the lowest number of experimental studies and thus has been perceived with a grain of salt because its results have not been allowed as criminal evidence at court yet, and its findings are not sufficiently accurate. Neuropolitics, as a teenage neuro-x field, has not been completely institutionalised and yet it has managed to accomplish the situation in which the public and journalists' minds are in complete turmoil over the possible misuse and political indoctrination. Hence, at first, in terms of research targets, and albeit in overlapping conditions, two trajectories of neuropolitical research have been propounded. First, ancillary elements, that have already been recognised by scientists, specialise in empathy, emotions, racial and religious biases and ethics, followed by humanities, such as the art, and its relation to physiology and the human brain. Second, there are solely political elements such as public policy and international relations which have already appeared in fragmentary attempts of neuropolitical analyses. Even though a vast majority of them did not consider other components but power in a philosophical view, a restricted number of papers has already examined complex facets as, for instance, aggressive behaviour, political authoritarianism, negotiation abilities in diplomacy in accordance with psychology, and inclinations to terrorism in respect of physiological traits. Altogether, political neuromarketing has endured as the most palpable example of neuropolitical research. Despite the excitement expressed by the journalists and neuromarketing companies, it is necessary to bear in mind that the outcomes of neuromarketing are still tenuous.

Accordingly, four main types of tools were introduced. The tools zeroing in on cerebral metabolic or electric activity were contrasted with the tools of electrodiagnosis (EDX), facial electromyography (fEMG) and electrodermal activity (EDA), and eye-tracking. For each tool, a SWOT analysis was delivered to demonstrate not only its further employment in neuropolitics but also to accentuate the problems exacerbating possible neuropolitical research studies *vis-à-vis* the technical aspects, research foci and resources. Notwithstanding the frequency in use of fMRI and EEG, it was observed that these costly tools are to be better employed for long-term oriented patterns of human behaviour, while eye-tracking, by contrast, serves as a suitable means of neuromarketing. EDA and especially fEMG represent boundary tools of which research felicitousness, and its subsequence significance, resides in the character of research and objectives. Subsequently, neuroethics exemplifies the complex nature of neuropolitics as a neuro-x field. Therefore, not only the origins of neuroethics were delineated but the field's importance was characterised regarding the consequences of neuroscientific research. A specific emphasis had to be put on politics due to its interconnectedness to the powers of state authorities and indoctrination.

Chapter six served as a theoretical basis for the experimental investigation. It foregrounded the most frequent indicator, which has been considered to be the most salient variable of neuropolitics as such. This chapter summarised the upheavals in understanding ideology and political leanings up to nowadays. Subsequently, the main findings of neuropolitics, that were connected to political ideology, were contrasted and scrutinised, since the aim of the thesis was to test political leanings as a key variable in the Czech instance. Notwithstanding the evidence of differences between conservatives and liberals in, for instance, the volume of grey matter, ACC or amygdala activity, a vast majority of findings originated in the USA, and it substantially exacerbates additional endeavours to generalise.

* * *

Two groups of participants took part in the pilot experiment that employed EDA and fEMG. Grammar school (G) and secondary vocational school (S) pupils, n=10, aged 18, were inquired in their physiological reactions to non-democratic ideology versus democracy, and its respective political representatives. Whilst the skin conductance response (SCR) did not indicate substantial figures in the statistical models, fEMG and its two indicators, the zygomaticus major and corrugator supercilii, testified that the pupils of these two groups exhibited dissimilar physiological reactions to non-democracy and democracy in this study. One exception has, however, appeared. And it was the zygomaticus major, ie, positive perceptions, of non-democratic ideologies, in which pupils reacted coincidently. This finding is in accord, for instance, with Decety, Pape and Workman (2018), who gave evidence that people even share the same predispositions to terrorism, but they make itself felt only in some cases. And the question is whether or how much does ideology affect or trigger the process of becoming a terrorist. Similarly, the pupils at grammar schools shared the same physiological traits with pupils of secondary vocational school. However, in this case of two types of institutions, ideology, however, as an interpretive variable has not met the criteria.

By contrast, positive and negative reactions to ideology of democracy and democratic leaders showed evident differences. In the R models analysing the relevance of political leanings, the null hypotheses were falsified, since no significant importance of leanings, nor social class affiliation, could be recorded. On average, this pilot experiment has observed a significant and yet indicative physiological difference between the pupils of two examined types of institutions in their perceptions of democracy and non-democracy. Therefore, one may accentuate the existence of non-democratic predispositions, but these cannot be explained by political leanings in the Czech context, at least at the moment. Despite the fact that the results of this study are of an indicative character and therefore cannot be universalised forthwith without any additional testing and having the sample extended, the original purport of this thesis was to call attention to a new perspective of research in experimental political science as well. And in respect of societal tendencies, this pilot experiment itself may then serve as an initial point of reference for other further analyses in the fields of neuropolitics and experimental political science.

On the one hand, the findings are in line with other scholars (eg, Kossowska, van Hiel 2003; Thorisdottir et al. 2007) that had already adverted to the problems of portability of ideology to the territory of CEE, and the Czech Republic (Kremláček et al. 2019) in particular. On the other hand, neuropolitics assumes a great deal of its existence on political leanings. And the fact that this concept cannot be sufficiently applied across the world as a generalising variable only emphasises the salient need to elaborate on the variable and its clarification in deeper physiological, genetic, and brain-based traits, otherwise new variables will have to be identified instead. Nevertheless, even when engaging in the human brain and ROIs, as Koukolík aptly notes (2012, p20), it is necessary to remain guided *cum grano salis,* ie, without taking things literally and whilst remaining in distance.

In case of the Czech participants in this pilot study, the experiment recalled that the complex character of political leanings mirrors in the widely preferred political centrism. It is, therefore, imperative that scholars take this phenomenon into account too because, albeit in American politics, Lindgren (2012) detected authoritarian tendencies amongst centrist voters, while other common conservatives and liberals did not exhibit this behavioural pattern.

* * *

Questions that pertain to the aspects of human political nature and corresponding behaviour have been posed for centuries, but only the contemporary modern technologies allow researchers to delve into the *political mind* more thoroughly. Before doing so, however, neuroscience practitioners and political scientists will have to compromise and be willing to accept the specifics of both disciplines. First, neuroscience pundits will need to realise that the core of research will not be based on mere data descriptions and discussions, but socio-political context and consequences as well. Secondly, by contrast, political scientists will have to acquiesce in, for instance, shorter papers and less of padding, too. The general need to deliver pioneering and ground-breaking outcomes may become a true trigger for this *mariage de convenance* to be completely fulfilled.

* * *

In conclusion, and in order to lighten the debate, one may appraise that Otto von Bismarck's initial quote, stressing no germane liaison between politics and science, is to be rebutted due to the fact that politics as such has been interspersed by science, physiology, and neuroscience in particular, of which understanding is and will have remained the soothfast mastery. Having said that, however, one modifying quotation may be attributed to this statesman. After correcting himself appositely, and thus consonant with the 21st century research, he avouched that *"Politics as Science would teach of the Feasible (Möglichen)"*.[306] Hence, politics has been grounded in science by which one has been powerfully determined for centuries. The art of statecraft then lingers on the capability to exploit it so that one's own ideology is solely the only one to prevail.

[306] Originally, the 1863 quote *"Die Politik ist die Lehre vom Möglichen"*, as attributed to Otto von Bismarck, was loosely translated by the author.

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APPENDICES

NMSBA's Code of Ethics

DEFINITIONS

1. Neuromarketing Research, is the systematic collection and interpretation of neurological and neurophysiological insights about individuals using different protocols allowing researchers to explore non-verbal and physiological responses to various stimuli for the purposes of market research.

2. **Neuromarketing Researcher** is defined as any individual or an organization carrying out, or acting as a Neuromarketing consultant on, a Neuromarketing research project, including those working in organizations buying services from a neuromarketing research company.

3. **Neuromarketing Client** is defined as any individual or organization that inquires, buys or sponsors or a Neuromarketing research project.

4. **Neuromarketing Research Participan**t is defined as any individual or an organization from which insights are collected using neuroscientific methods for the purposes of market research.

5. **Neuromarketing Study** is defined as a session with a participant during which Neuromarketing insights are collected.

6. **Neuromarketing Insights** are informed deductions supported by analysing the amount of brain activity produced by marketing stimuli (advertisements, websites, packaging, etc.).

7. **Functional brain imaging** is defined as any technique that permits the in vivo visualization of the distribution of brain activity.

§1: CORE PRINCIPLES

a. Neuromarketing researchers shall comply with the highest research standards enforced in their respective countries and use accepted scientific principles.
b. Neuromarketing Researchers shall not act in any way that could negatively impact the reputation and the integrity of the Neuromarketing research profession.
c. Neuromarketing findings shall be delivered to clients without exaggerating or misrepresenting the neuromarketing insights beyond what is scientifically accepted.

§2: INTEGRITY

a. Neuromarketing researchers shall take all reasonable precautions to ensure that participants are in no way harmed or stressed as a result of their involvement in a Neuromarketing research project.

b. Neuromarketing researchers shall not deceive participants or exploit their lack of knowledge of neuroscience.

c. No sales offer shall be made to a participant as a direct result of his/her involvement in a project.

d. Neuromarketing researchers shall be honest about their skills and experience.

§3: CREDIBILITY

a. Concerns or critics about publicly known neuromarketing projects shall be first presented to the attention of the NMSBA before they are shared widely.

b. Neuromarketing researchers involved in functional brain imaging shall disclose a protocol for dealing with incidental findings.

§4: TRANSPARENCY

a. Participation in a Neuromarketing research project shall always be entirely voluntary.

b. Neuromarketing researchers shall maintain a public website describing their services and the credentials of their core team members as well as post a physical address where officers of the company can be contacted.

c. Neuromarketing researchers shall allow their clients to audit the process by which neuromarketing insights are collected and processed.

d. Neuromarketing researchers shall ensure that Neuromarketing research projects are created, delivered and documented with transparency and reported with as many details as the clients would require to understand the scope and relevance of the project.

§5: CONSENT

a. Neuromarketing researchers shall explain the tools they use to participants in layman terms.

b. Before providing consent, participants in Neuromarketing research shall explicitly express their understanding of the protocols as well as the general objectives of the study.

c. Participants shall be fully informed about the project before any Neuromarketing technique can be used to collect their neuromarketing insights.

d. Once a Neuromarketing study has commenced, participants shall be free to withdraw.

§6: PRIVACY

a. Neuromarketing researchers shall ensure that participants are made aware of the purpose of collecting insights.
b. Neuromarketing researchers shall have a privacy policy which is readily accessible to participants from whom they collect insights.
c. The identity of participants will not be revealed to the client without explicit consent.
d. Personal information collected shall be collected for specified Neuromarketing research purposes and not used for any other purpose.
e. Personal information may not be kept longer than is required for the purpose of the neuromarketing project.
f. Neuromarketing researchers shall ensure that adequate security measures are used to protect access to the insights collected during any project.
g. The Neuromarketing research data itself, including brain scans and brain data shall remain the property of the research company and will not be shared.

§7: PARTICIPANT RIGHTS

a. Participants to any neuromarketing research project shall confirm that they are not obligated to participate in the project.
b. Participants to any neuromarketing research project shall be able to withdraw from the research at any time.
c. Participants to any neuromarketing research project shall be guaranteed that their personal data is not made available to others.
d. Participants to any neuromarketing research project shall be guaranteed that the insights will be deleted or modified upon request.
e. Particular care shall be taken to maintain the data protection rights of participants when personal data is transferred from the country in which they are collected to another country. When data processing is conducted in another country, the data protection principles of this Code must be respected.

§8: CHILDREN AND YOUNG PEOPLE

Neuromarketing studies involving participants less than 18 years of age shall only take place with the informed consent of the participant’s parents.

§9: SUBCONTRACTING

Neuromarketing Researchers shall disclose prior to work commencing, when any part of the project is to be subcontracted outside the neuromarketing researchers' own organization (including the use of any outside consultants).

§10: PUBLICATION

When results of a project are publicly shared, neuromarketing researchers shall clearly articulate which part of the report represents an interpretation of the data vs. which part of the data represent the key findings. Neuromarketing researchers shall not associate their names to a Neuromarketing research project unless they have actively participated in the project and are able to defend the findings.

§11: COMMITMENT

Neuromarketing researchers shall commit that they will apply this code and ensure their own clients and other parties will comply with its requirements. Failure to do so will result in the termination of their membership.

§12: IMPLEMENTATION

a. Neuromarketing researchers and their clients shall acknowledge that they know the code and also respect other self-regulatory guidelines that are relevant to a particular region or project; The Code is applicable for all involved in a Neuromarketing project.
b. The NMSBA Members shall show their acceptance of the code, by publishing the code on their website or by publishing a link to www.nmsba.com/ethics.

Source: https://www.nmsba.com/buying-neuromarketing/code-of-ethics

Informed consent

(The form as it had been used for filling in specifically for this experiment; translated from Czech)

§1 I, ..., voluntarily agree to take part in the experiment on political behaviour and predispositions.
§2 I understand that I am allowed to suspend this informed consent without giving any explanations, and it will not have any negative consequences.
§3 I understand that within a period of one week from the date of experiment, I may suspend this informed consent. It must be done via email at the below stated email address. In this case, the corresponding data must be deleted.
§4 The informed consent and selected procedures of this experiment have been sufficiently explained, and I was given enough room to ask questions regarding the techniques of research.
§5 I understand that my participation is based on the following: filling in a questionnaire survey, followed by watching a photograph presentation.
§6 I agree on non-invasive recording of my muscular activity whilst using the facial electromyography (fEMG), and the skin conductance while recording my electrodermal activity (EDA).
§7 I understand that my participation does not imply any fixed income.
§8 I understand that all the findings and data as acquired in this experiment are strictly confidential.
§9 I understand that in any final study using the data from this experiment, my identity will be encoded and anonymised.
§10 I understand that this signed informed consent, the findings and data will be properly stored and in possession of Martin Petlach and Department of Psychology, Palacky University in Olomouc, until 1 January 2027.
§11 I understand that I am allowed to contact Martin Petlach in order to ask further questions in respect of this project.
(§12 I understand that due to the placing of electrodes in the course of experiment, I will not be able to wear a face or surgical mask, nor a respirator.)

-- ----------------
Participant's signature / Date

I understand that the participant has given his or her informed consent to take part in this experimental investigation.

--- ---------------------
Martin Petlach, Researcher's signature / Date
Department of Politics and European Studies, Faculty of Arts, Palacky University
Email: *martin.petlach01@upol.cz*

Questionnaire form

(The form as it had been used for filling in specifically for this experiment; translated from Czech)

Anonymised ID: __________

1. Are you:
   a) female b) male

2. I live in:
   a) a town b) a village

3. How much are you interested in politics?
   A 5-point scale from Very interested to Not at all interested

4. Do your parents go to the polls on a regular basis?
   a) Yes, regularly b) Yes, irregularly
   b) No c) No opinion

5. People often talk about political leanings (be it left or right). Where would you place yourself at the below given scale?
   A 5-point scale from Absolutely left to Absolutely right wherein 3 indicates centrism

6. Society has always been divided into two groups: the rich and poor. Do you concede this state and perceive it as right and defensible in the future?
   A 5-point scale from Strongly agree to Strongly disagree wherein 3 indicates no opinion

7. Society has changed dramatically in the last years, especially in attitudes towards women, minorities, violence, green politics, etc. Do you support fast changes currently happening in society?
   5-point scale from to Strongly agree to Strongly disagree wherein 3 indicates no opinion

8. Which party would you vote for if a general election were called for tomorrow?
   a) Christian Democrats (KDU-ČSL)
   b) Civic Democrats (ODS)
   c) Communist Party of Bohemia and Moravia (KSČM)
   d) Czech Pirate Party (Piráti)
   e) Czech Social Democrats (ČSSD)

f) Freedom and Direct Democracy (SPD)
g) Green Party (SZ)
h) Mayors and Independents (STAN)
i) The Yes Party (ANO)
j) TOP 09 (TOP 09)
k) Tricolour (Trikolóra)
l) If other, specify: __________

9. In respect of social status, I consider my family to be:
   a) working class b) middle class c) upper class

10. Democracy is the best form of government.
    A 5-point scale from Strongly agree to Strongly disagree wherein 3 indicates no opinion

11. Name your favourite music genre:
    a) Pop
    b) Rock and indie rock
    c) Metal
    d) Rap and hip hop
    e) Electronic / House / Dance
    f) Jazz and blues
    g) Country
    h) Folk music
    i) Classical music

12. I study at:
    a) Grammar School b) Secondary vocational school

Analysed clusters

Non-democratic cluster

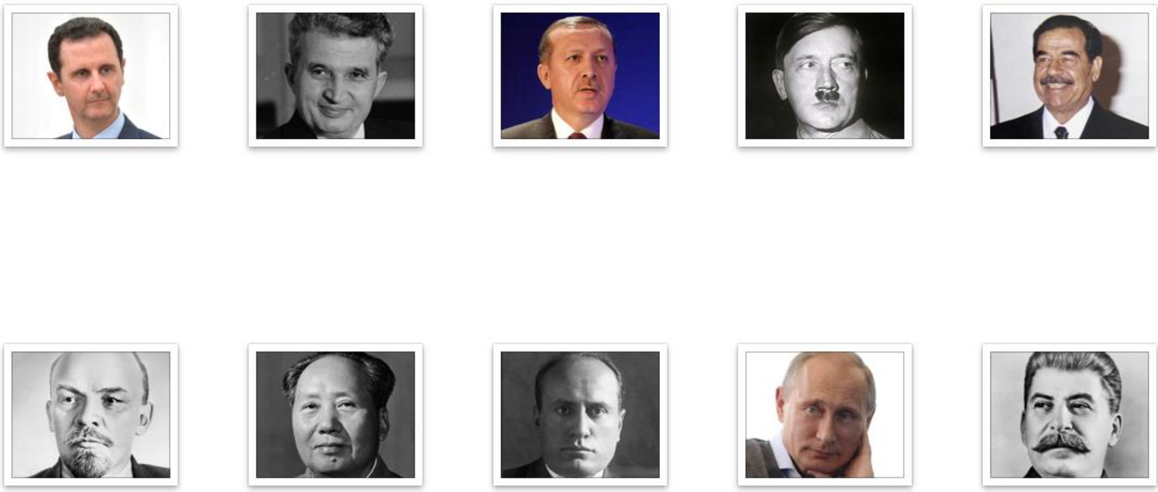

Figure 38 Non-democratic cluster

Democratic cluster

Figure 39 Democratic cluster

Control cluster

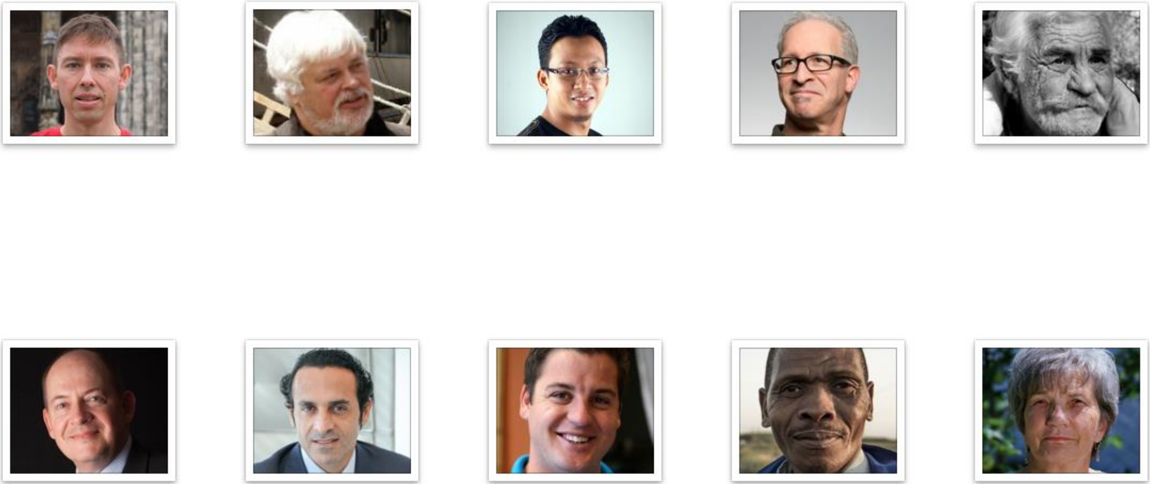

Figure 40 Control cluster

ABSTRACT (EN)

Neurobiological Underpinnings of Politics: A Physiological Instance of Non-Democratic Predispositions in an fEMG & EDA Pilot Study

Are we physiologically wired to endorse or loathe democratic institutions? A question, that this thesis endeavoured to expand upon and further set up, has been traditionally asked by scholars whilst analysing the human body and the brain in connexion to the type of state administration. First, the origins and milestones of research were discerned in the global and local perspective. Afterwards, an emphasis was put on the newly emerging neuro-x fields, including its latest branch represented by neuropolitics, the prime crux of this thesis. In this respect, specific trajectories of neuropolitical research foci and respective tools of neuroscience were identified and appraised. Furthermore, neuroethics, as a salient field that runs through, has exemplified the complex character exacerbating further development in the area. The crucial and variable of political leanings, which is based on ideology, comprised the theoretical basis for the ensuing pilot experiment. After employing EDA and fEMG, the thesis disclosed a difference in physiological traits occurring between examined groups of Czech grammar school and secondary vocational school pupils in their responses to democracy and ideologies. The only similarity has been uncovered in case of positive reactions to non-democratic ideologies, since in this case physiological traits did not vary. Lastly, the prominent position of political leanings and social class system, as the main variables of Western neuropolitics, were not necessarily vindicated in the Czech Republic. Although this pilot study has yielded indicative results, and thus without having the outcomes substantiated for the entire population; as a methodological probe, it has adverted to certain societal trajectories and new approaches to experimental political science residing in physiology. Finally, the closing sections of the thesis concentrated on the limits which have appeared across neuropolitical studies and, at the same time, in the thesis, too. Accordingly, proposals for further research studies were brought forward because the importance of neuropolitics is highly expected to increase.

Keywords:
Social neuroscience; neuropolitics; human brain; physiology; political leanings; EDA; fEMG; non-democratic predispositions

ABSTRAKT (CZ)

Neurobiologická východiska politiky: Fyziologický případ nedemokratických predispozic v pilotní studii s fEMG & EDA

Jsme fyziologicky naprogramovaní k podpoře, nebo k odporu vůči demokratickým principům? Tuto otázku, kterou se práce snaží hlouběji rozvinout, si filozofové tradičně kladli při studiu lidského těla a mozku, a později také v souvislosti s druhem státního uspořádání. Nejprve proto byly v globální i místní perspektivě identifikovány počátky a hlavní milníky daného výzkumu. A následně se text zaměřil na nově vzniknuvší neuro-x obory, v rámci nich se poté jako jedna z posledních začíná etablovat také neuropolitika, hlavní námět práce. V tomto směru byly proto stanoveny a zhodnoceny nejen konkrétní trajektorie hlavních výzkumných oblastí neuropolitiky, ale též příslušné nástroje neurověd. Jako významný obor se tématem prolíná neuroetika, jež důsledně ilustruje náročnou povahu, která znesnadňuje další vývoj ve zkoumané oblasti. Politická orientace, zásadní proměnná založená na ideologických pólech, poté tvořila teoretický podklad pro pozdější ukázkový pilotní experiment. S využitím přístrojů EDA a fEMG bylo následně zjištěno, že mezi zkoumanými českými gymnaziálními žáky a žáky střední odborné školy existují rozdíly ve fyziologických znacích při jejich reakcích na demokracii a ideologie. Jedinou shodu mezi žáky se podařilo objevit v případě pozitivních reakcí na nedemokratické ideologie, v rámci nich se fyziologické znaky nelišily. Posléze nebyla nevyhnutelně potvrzena význačnost politické orientace a třídního systému jako stěžejních proměnných jako je tomu v západních studiích. Přestože výsledky této pilotní studie zůstávají orientačními, a tudíž bez možnosti okamžité obhajitelnosti závěrů pro celou populaci, práce jako metodologická sonda poukázala na určité společenské trajektorie a nové přístupy k experimentální politologii tkvící ve fyziologii. Závěrečná část práce se věnovala limitujícím faktorům, které se vyskytují v neuropolitických studiích i v práci samotné. Ve finální části diskuse byly stanoveny návrhy na další výzkum, jelikož se očekává, že význam neuropolitiky do budoucna nadále poroste.

Klíčová slova:

Sociální neurověda; neuropolitika; lidský mozek; fyziologie; politická orientace; EDA; fEMG; nedemokratické predispozice.

RESUMEN (ES)

Fundamentos neurobiológicos de la política: Una instancia fisiológica de predisposiciones no democráticas en un estudio piloto de fEMG & EDA

¿Somos fisiológicamente programados para respaldar o detestar las instituciones democráticas? Una pregunta, que la tesis doctoral se esforzó por ampliar y establecer más, ha sido tradicionalmente planteada por los académicos al analizar el cuerpo humano y el cerebro en relación con el tipo de administración. Al principio, los orígenes y los hitos de la investigación se discernieron en la perspectiva global y, asimismo, local. Luego, se hizo hincapié en los neuro-campos, incluida su última rama representada por la neuropolítica, la esencia principal de esta tesis. A este respecto, se identificaron y evaluaron trayectorias específicas de focos de investigación en neuropolítica y herramientas respectivas de neurociencia. Además, la neuroética, como un campo destacado que tiene lugar, ha ejemplificado el carácter complejo que exacerba un mayor desarrollo en el área. La variable crucial de las orientaciones políticas, que se basa en la ideología, comprendió la base teórica para el siguiente experimento piloto. Después de emplear EDA y fEMG, la tesis reveló la diferencia en los rasgos fisiológicos que se producen como reacción a la democracia e ideologías entre los grupos examinados de alumnos checos del instituto y del instituto de formación profesional. La única similitud se ha descubierto en caso de reacciones positivas a ideologías no democráticas, ya que en este caso los rasgos fisiológicos no variaron. Por último, la posición prominente de las orientaciones políticas y el sistema de clase social, como las principales variables de la neuropolítica occidental, no se necesariamente reivindicaron. Si bien los resultados de este estudio piloto siguen siendo indicativos y, por lo tanto, sin la posibilidad de corroborar las conclusiones para toda la población, el trabajo como sonda metodológica ha indicado ciertas trayectorias sociales y nuevos enfoques de la politología experimental inherentes a la fisiología. Para concluir, las secciones finales de la tesis se concentraron en los límites que han aparecido en los estudios neuropolíticos y, al mismo tiempo, en la tesis también. En consecuencia, se presentaron varias propuestas para estudios de investigación adicionales porque se espera que aumente la importancia de la neuropolítica.

Palabras claves:
Neurociencias sociales; neuropolítica; cerebro humano; fisiología; inclinaciones políticas; EDA; fEMG; predisposiciones no democráticas.

SYNOPSIS

Student's names and surname:	PhDr Martin Petlach
Department and Faculty:	Department of Politics and European Studies Faculty of Arts, Palacky University
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Appendices:	6
Keywords:	Social neuroscience; neuropolitics; human brain; physiology; political leanings; EDA; fEMG; non-democratic predispositions.

Abridged characterisation:

This thesis expanded upon the concept of neuropolitics and its possibilities of application. First, the author has identified the origins of research specialising in the liaison between the human brain and mind, and politics from both the global and local perspective. Subsequently, an increase in literature on social and political neuroscience was analysed in connexion to the tools of neuroscience, together with its usability for neuropolitical research. Afterwards, an experimental pilot study was employed whilst using two tools of electrodiagnosis (EDX), EDA and fEMG. After appraising the findings, further research trajectories and limitations were outlined and stressed too.