Andrew R. Thomas
Nicolae Alexandru Pop
Ana Maria Iorga · Cristian Ducu *Editors*

Ethics and Neuromarketing

Implications for Market Research and Business Practice

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Editors
Andrew R. Thomas
University of Akron
Broadview Heights, OH, USA

Ana Maria Iorga
Bucharest Academy of Economic Studies
Bucharest, Romania

Nicolae Alexandru Pop
Faculty of Marketing
The Bucharest Academy
of Economic Studies
Bucharest, Romania

Cristian Ducu
Centre for Advanced Research
in Management and Applied Ethics
Bucharest, Romania

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Abbreviations

AMA	American Medical Association
APA	American Psychological Association
ARF	American Research Foundation
CIOMS	Council for International Organizations of Medical Sciences
EEG	Electroencephalography
ESF	European Science Foundation
ESOMAR	European Society for Opinion and Market Research
ET	Eye tracking
FDA	US Food and Drug Administration
fMRI	Functional magnetic resonance imaging
GSR	Galvanic skin response
IRB	Institutional Review Board
MEG	Magnetic encephalography
MRI	Magnetic resonance imaging
NMSBA	Neuromarketing Science & Business Association
PET	Positron emission tomography
TMS	Transcranial magnetic stimulation
SPECT	Single photon emission tomography

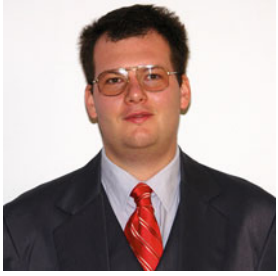
Contributors

Fabio Babiloni He is currently Professor of Physiology at the Faculty of Medicine of the University of Rome "Sapienza," Rome, Italy. He is also full professor of biomedical engineering and teaches Physiology and Neuroscience, Industrial Neuroscience, and Biomedical Engineering courses. He is the author of 200 papers on bioengineering and neurophysiology topics in international peer-reviewed scientific journals and has more than 250 contributions to conferences and books chapters. He wrote several books on EEG signal processing. He is Scientific Director of BrainSigns.

Giulia Cartocci Since 2015, Giulia collaborates with BrainSigns, being involved in the clinical application of the technological protocols for the acquisition of human biosignals (EEG) in particular aiming at measuring the approach/withdrawal motivation towards stimuli and the cognitive effort related task execution. She is also involved in writing and submitting national and international research proposals (mainly European Projects) and scientific publications concerning BrainSigns research topics (Clinical Trials, Neuroaesthetics, and Neuromarketing).

Patrizia Cherubino Since 2010, Patrizia collaborates with BrainSigns in the Neuromarketing Research & Innovation area. The main activity is focused around the generation and validation of biometrics tests for the evaluation of TV commercial and consumer stimuli using EEG, HR, and GSR signals. Her expertise is also focused on the evaluation of the Neuroaesthetic, Neuroshopping, and Neuropolitics studies. She is also coauthor of several publications on neuromarketing in peer-reviewed scientific journals and coauthor of a neuromarketing book.

Kimberly Rose Clark Kimberley currently serves as Senior Lecturer and Affiliated Researcher for Dartmouth College's Department of Psychological and Brain Sciences in Hanover, New Hampshire, USA, and is the Co-Founder and Chief Research Officer for the research and consulting firm Merchant Mechanics, Inc.



Dan-Cristian Dabija Dan-Cristian is Associate Professor at the Department of Marketing, Faculty of Economics and Business Administration, Babeş-Bolyai University, Romania. His teaching and research fields are retailing, international marketing, consumer behavior, and tourism marketing. Since December 2015 he is a Ph.D. supervisor in Marketing. Dan-Cristian currently leads a research project on sustainable retailing.

Terry Daugherty Terry is an Associate Professor and Chair of the Department of Marketing in the College of Business Administration at the University of Akron. He is an expert in interactive marketing, consumer psychology, and behavioral research methods having authored numerous publications while presenting his intellectual work at research conferences worldwide. He has led the Consumer Neuroscience Research Initiative at UA since 2010 and is also Editor-in-Chief of the *Journal of Interactive Advertising*.

Cristian Ducu Cristian holds a Ph.D. in Moral Philosophy from the University of Bucharest, and he is the General Manager of the Centre for Advanced Research in Management and Applied Ethics, an independent research and consulting NGO. In the last 13 years, he specialized in Applied Ethics (mostly, Business Ethics, Communication Ethics, Bioethics, and Ethics in New and Emerging Technologies) and taught various classes in these fields at the University of Bucharest and National University of Political Studies and Public Administration.

Gregory Dumont Greg is currently the Director of Students and Assistant Professor of Marketing at Plymouth State University in New Hampshire. He has earned an M.B.A, M.S. in International Business and Ph.D. in International Business with a concentration in Marketing. As a former collegiate athlete, he has maintained an interest in sports and his current research interest remains focused on the sporting firm, mega sporting events in particular. His research has increasingly integrated the unique insights gleaned through behavioral economics and neuroimaging to analyze the marketing of sports and marketing of non-sports brands through sports.

Gianluca di Flumeri Gianluca is a Biomedical Engineer, currently a Ph.D. Student in Morphogenesis and Tissue Engineering, Biophysics curriculum. His main research activity is focused on the acquisition and analysis of human biosignals (EEG, HR, GSR, EOG), to investigate cognitive processes and mental states, in particular in operational environments. He has a great expertise in GUIs and signal processing in Matlab.

David Hensel He is a Ph.D. candidate and research assistant at the Institute of Marketing at Helmut Schmidt University, Germany. He is responsible for the advertising research of the employer Bundeswehr in a project funded by the Federal Armed Forces. He holds a Master of Science in business administration from the University of Hamburg with a focus on marketing. His research interests are neuromarketing and implicit measurement methods.

Ernest Hoffman Ernest is a Management Consultant for PRADCO in Columbus, Ohio, USA. His primary research interests center around leadership, consumer neuroscience, and research methods/measurement. He holds a B.A. in Psychology, an M.A. in Psychology, and a Ph.D. in Industrial and Organizational Psychology from the University of Akron.

Ana Maria Iorga Ana is a savvy neuromarketing expert that has a passion for bringing science to marketing. She is a Medical Doctor that holds a double M.B.A. in marketing and finance from the University of Ottawa and is currently a Ph.D. student in neuromarketing with the Bucharest Academy of Economic Studies. She has over 10 years of experience as an advertising professional and entrepreneur, leading a full-service advertising agency. In 2012, she founded Buyer Brain, a consumer neuroscience research lab.

Eugenia Laureckis Researcher and marketing consultant. Lecturer at EEN Business School (Madrid, Spain), ISG (Lisbon, Portugal), and HMS (Hamburg, Germany). She holds a B.A. in International Trade, an M.S. in International Business, another in Management Development, and an M.Sc. in Knowledge and Information Society. She's pursuing her Ph.D. in Economics (Marketing).

Nansi Lungu Nansi is a behavioral analyst and trainer with an interdisciplinary background (Cognitive Science, Logic, Philosophy). He is the coordinator of the Consumer's Psychology Department within Bitdefender, a Romanian IT company, and Lecturer at Titu Maiorescu University, Bucharest, Romania. He is also the founder of Mindset, a consulting firm specialized in educational programs.

Anton Giulio Maglione Giulio is a Biomedical Engineer. He collaborates with BrainSigns since 2011. His main research activity is focused on the acquisition and analysis of human biosignals (electrocardiography, electrodermal activity, and electroencephalography), to investigate cognitive and emotional processes in clinical, neuromarketing, and neuroaesthetics environments.

Michał Matukin Michał is a social psychologist working in marketing research based on neuroscientific research methods since 2007. He is the Chief Scientific Officer at NEUROHM, a global neuro research and technology provider. His research focuses on affective neuroscience applied to marketing communications. He authored several publications in journals and books including the *Journal of Interactive Advertising*, *Journal für Marketing* or the book *Dynamics in Emotions: Science and Practice*.

Àlex Martínez Miralpeix Human Resources and Neuromarketing consultant, Psychologist specialized in personality and behavior. Lecturer at EEN (Madrid, Spain), ISG (Lisbon, Portugal), and HMS (Hamburg, Germany). He is also President of the Institute of Morphopsychology "Louis Corman" and author of two books about Memory. He holds a B.A. in Psychology, an M.S. in Graphology, an M.Sc. in Research Techniques, and a Ph.D. in Psychology.

Enrica Modica Since November 2015, Enrica is a Ph.D. student in Morphogenesis and Tissue Engineering, Cellular and Tissue Biophysics curriculum, at the University of Rome Sapienza. Her main research activity, on behalf of BrainSigns, is focused on the acquisition and analysis of biosignals (EEG, HR, GSR, Eye Tracking). She developed expertise in the field of Web Usability based on the detection of physiological responses during user interaction with the Web sites, the technique eye tracking, and use of specific software for the study of the Usability.

Rafał Ohme Rafał Ohme is Professor of psychology at the University of Social Sciences and Humanities in Poland and Honorary Professor at the Department of Business Management School in Stellenbosch, in South Africa. His research focuses on automatic processing of information, implicit social cognition, emotions, and communication. His company, NEUROHM, creates neurophysiological and reaction-time based methods. Author of more than 150 articles, a book *Subliminal Facial Information* (2003), a scientific Editor of *Unconscious Affect* (2007), and trilogy *Automaticity* (2001, 2002, 2003).

Nicolae Al. Pop He currently serves as Professor for the Marketing Department of the Bucharest University of Economic Studies. He is also a specialist in relationship marketing, international marketing, and neuromarketing. He is also Professor at the University of Applied Sciences Bochum, at Babeș-Bolyai University Cluj-Napoca, at Politehnica University of Bucharest, visiting professor la HEC Montreal, TU Darmstadt, ISCAE Casablanca, Goethe University Frankfurt Main, and CNAM Paris. Dr. Pop is also *Doctor honoris causa* of the University of Oradea.

Dario Rossi Since 2015, Dario is a Ph.D. student in Morphogenesis and Tissue Engineering, Cellular and Tissue Biophysics curriculum, at the University of Rome Sapienza. He is specialized in the evaluation of the visual perception of different stimuli such as pictures, videos, real objects, or different kind of environments, in particular in Neuromarketing area.

Andrew R. Thomas Andrew is Associate Professor of Marketing and International Business at the University of Akron and the bestselling author of 21 books. His most recent works include *The Customer Trap: How to Avoid the Biggest Mistake in Business* and *Global Supply Chain Security*. His book *The Distribution Trap: Keeping Your Innovations from Becoming Commodities* was awarded the Berry-American Marketing Association Prize for the Best Marketing Book of 2010. *Direct Marketing in Action* was a finalist for the same award in 2008. Andrew has traveled to and developed sales and distribution channels in 120 countries on all seven continents.

Arianna Trettel Arianna is co-founder and general manager of BrainSigns, a marketing research company, and has more than 20 years of activity in marketing research supporting communication and social education. She is also the Italian chair of NMSBA since 2012. At BrainSigns, she coordinates Neuromarketing studies for big companies and brands and also contributes to books and scientific articles in the field, with focus on EEG measurements combined with other biometric tools.

Lisa-Charlotte Wolter She studied business administration at the University of Hamburg, Copenhagen Business School, and University of Technology Sydney. She completed her doctorate in the field of media and brand management. From 2011 until 2014 she held a research fellowship from Hubert Burda Media. Subsequently, she consults companies in media strategic issues and founded a Neuro Lab at Hamburg Media School together with a leading digital content marketing company in Germany. Her research interests are media engagement, consumer neuroscience, and strategic brand management.

Judith Znanewitz Judith is a Ph.D. candidate and research assistant at the Institute of Marketing at Helmut Schmidt University, Germany. She is responsible for market research concerning the employer brand Bundeswehr in a project funded by the Federal Armed Forces. She holds a Master of Science in business administration from the University of Hamburg with a focus on marketing and public management. Her research interests are neuromarketing and human resource management.

Chapter 1
Introduction

Andrew R. Thomas

At its core, neuromarketing aims to better understand the impact of marketing stimuli, by observing and interpreting human emotions. The rationale behind neuromarketing is that human decision making is not so much a conscious process. Instead, there is more and more evidence that the willingness to buy products and services is an emotional process where the brain uses shortcuts to accelerate the decision-making process.

Neuromarketing focuses on which emotions are relevant in human decision making, and uses this knowledge to make marketing more effective. The knowledge is applied in product design, enhancing promotions and advertising, pricing, store design, and improving the consumer experience in a whole. The field lies at the intersection of economics, neuroscience, consumer behavior, and cognitive psychology.

At the strategic level, the vast majority of firms operating under the umbrella of neuromarketing are active in the market research domain. These companies evaluate commercials, advertisements, and new products, and measure audience responses to media like broadcasting or movies.

Tactically, neuromarketing operates at the following levels:

Product Design and Packaging
How a product looks, feels, and functions strongly impacts the consumer experience. Applying neuromarketing principles and neuromarketing testing can provide insights into the emotional effects of design choices.

Pricing
Marketers have known for a very long time that price is an important variable in the success of product and service. Knowledge on how price information is perceived and processed is the added value of neuromarketing in this part of the marketing process.

A.R. Thomas (✉)
Department of Marketing, University of Akron, Akron, OH, USA
e-mail: art@uakron.edu

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Store Design
If every in-store decision were taken rationally, your weekly trip to the grocery shopping would take up to 8 h. The success of retailers depends on how consumers experience their stores and services, how easy they can navigate, and how products, price, and promotions are presented (and perceived). Shopper marketing can be enriched by real-time measurements of participants' emotions in a lab or in-store situation.

Neuromarketing in Professional Services
The professional service industry depends largely on human interactions. How B2B consumers experience the quality of these services is fundamentally an emotional process. This explains why the best offer for the best price does not always win the quote. Neuromarketing brings in some heuristics on how to act for better quality. Or for a better perceived quality, because most of the time the decision is taken before the service is delivered.

Neuromarketing in Advertising
While advertising is mainly a creative process, neuromarketing can add value by a better understanding of the effects of ads on human beings. Neuromarketing is well developed in advert testing on effectiveness. Predicting how well is related to likability and sales.

The foundation for all of this activity is data gathering and analysis. Like many new processes and innovations, much of neuromarketing is operating far ahead of current governmental compliance and regulation. Real concerns about the ethical nature of pervasive data collection and its applications exist. For example, there are tools that are extensively used in neuromarketing, like facial recognition software, that are powerful enough to monitor and detect a wide range of micro-expressions. These could denote a high level of stress, or suggest that the person is trying to conceal something. At present, this technology is being tested at several airports—under the guise of security and counterterrorism. Such an application raises an ethical issue: To what extent is it acceptable to screen the entire population using these powerful and intrusive techniques without getting passengers' consent? Furthermore, these techniques have a certain rate of false-positive results, thus misidentifying innocent civilians as potential terrorists.

While many of these new technologies originated in the USA, the American Government has been way behind the curve in curbing their use and potential exploitation. The industry in the USA has also been slow to develop ethical parameters to internally monitor and control their behavior. In Europe, the landscape has been much more proactive. This book will detail many of those efforts, and offer rational, constructive approaches to laying an ethical foundation for neuromarketing efforts.

Terry Daugherty of the University of Akron and Ernest Hoffman from PRADCO kick off this volume by providing a contextual overview of what constitutes the study and practice of neuromarketing. This is followed by an exploration of the ethical concerns surrounding neuromarketing—and a clarification of the ethical limits—by Cristian Ducu of the Centre for Advanced Research in Management and Applied Ethics in Romania. In the next chapter, David Hensel, Lisa-Charlotte Wolter, and Judith Znanewitz from the Hamburg Media School in Germany shed further light on existing ethical guidelines, particularly with respect to tool-based distinctions, in order to provide reliable answers for both academic and marketing practitioners.

Neuromarketing, as a young, emerging discipline, is facing exciting challenges. Eugenia Laureckis and Àlex Martínez Miralpeix from EEN Business School in Madrid turn up the resolution on important topics such as the ethical issues involving participants in neuromarketing research; consumers that experience the outcomes of such studies; and also the researchers that conduct them. It almost goes without saying that transparency and reliability are fundamental to building an ethical culture around neuromarketing. Arianna Trettel of BrainSigns in Italy, along with Patrizia Cherubino, Giulia Cartocci, Dario Rossi, Enrica Modica, Anton Giulio Maglione, Gianluca di Flumeri, and Fabio Babiloni, all from Sapienza University of Rome, dig deep into these critical areas.

This "newness" of neuromarketing is beginning to impact the conduct of market research. Michał Matukin of NEUROHM in Poland and Rafał Ohme of the University of Social Sciences and Humanities in Poland delve into how neuromarketing is increasing the robustness of obtained results by anticipating consumers' behavior more effectively than traditional questioning methods. To get a better sense of this impact as it relates to ethics, Nicolae Al. Pop of Bucharest University of Economic Studies in Romania; Dan-Cristian Dabija of Babeş-Bolyai University, Romania; and Ana Maria Iorga Bucharest University of Economic Studies and Buyer Brain, Romania, provide an empirical analysis of the ethical considerations regarding stakeholders in neuromarketing research.

While it is assumed that neuromarketing is done for appropriate business and academic reasons, there is always the possibility of utilizing it for less than proper means. Kimberly Rose Clark of Dartmouth College posits how to "deal with the devils," and articulates the responsibility of neuromarketing practitioners in conducting research for ethically dubious client agendas.

Next, Nansi Lung of Titu Maiorescu University in Romania reminds us that the ethics of neuroscience is inexorably linked to the discovery of prediction limits—and to the influence these predictions can have on us. Almost following in Kant's footsteps, we could say that once we know how much we can learn, we will also know how far we can take our actions. The necessity of setting rigorous standards for consumer profiling in the neuromarketing field is due not only to the future potential threats and the present potential of technology, but also to the tendency of neuromarketing to rapidly extend further to insufficiently mapped ethical areas. To enhance this argument, Ana Maria Iorga and Nicolae Al. Pop take a look at the ethical issues surrounding new technologies and how the evolution of neuromarketing might provide scholars and practitioners in other disciplines valuable insight.

We conclude by exploring neuromarketing ethics as they relate to the industry of sports. Gregory Dumont of Plymouth State University details how sports teams and leagues have started to use neuromarketing as a way to enhance the fan experience and build greater brand loyalty. Real-time ethical questions have arisen as the use of neuromarketing continues to expand in sports.

On behalf of my coeditors and each of the contributors to this volume, we would like to thank you for your interest in this most important topic. Much of the future of neuromarketing will depend upon honorable people continuing to build a foundation of integrity around the amazing tools and technologies that have evolved. Doing so will ensure the correct use of those tools and technologies, and provide a positive effect on the greater society.

Chapter 2
Neuromarketing: Understanding the Application of Neuroscientific Methods Within Marketing Research

Terry Daugherty and Ernest Hoffman

2.1 Introduction

A growing interest within marketing research is the movement away from self-reported consumer research toward the use of direct neuroscientific methods—characterized as *neuromarketing* (see Fig. 2.1). Neuromarketing is the application of neuroscience measurement techniques for understanding how consumers respond, both consciously and unconsciously, to marketing (Lee et al. 2007). This emerging discipline lies at the intersection of consumer behavior, neuroscience, economics, and psychology (Garcia and Saad 2008; Gordon 2002; Morin 2011) while examining a range of marketing topics, such as persuasion, decision making, cognition, and ethics, among others. The potential of neuromarketing has seemingly been embraced by many scholars (e.g., Advertising Research Foundation NeuroStandards Project 2013) and industry leaders (e.g., Nielsen, Buyology, Gallup and Robinson, Innerscope Research), and is often attributed to (a) an appreciation for scientific and objective measurement, which is preferable to more subjective methodological paradigms (e.g., surveys, focus groups), and (b) claims that such techniques constitute more accessible and cost-effective means (Ariely and Berns 2010; Daugherty, Hoffman and Kennedy 2016; Pradeep 2010). Nonetheless, in this chapter we contend that the full potential of neuromarketing has yet to be reached and present a baseline context for understanding common neuroscientific techniques within marketing research.

T. Daugherty (✉)
Department of Marketing, College of Business Administration, University of Akron, Akron, OH, USA
e-mail: terry.daugherty@uakron.edu

E. Hoffman
PRADCO, Columbus, OH, USA

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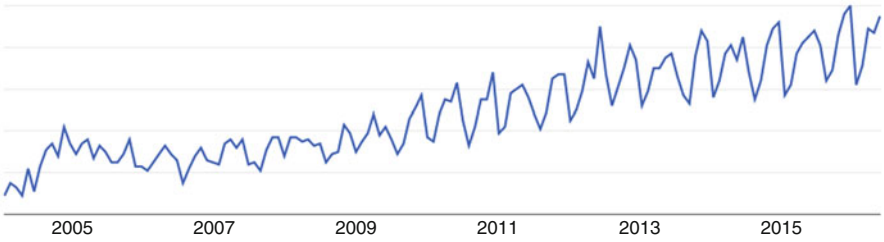

Fig. 2.1 Interest over time in neuromarketing. *Source*: Google Trends

2.2 Understanding Neuromarketing

Fundamentally, neuromarketing seeks to apply the principles, methodologies, and research findings of neuroscience to further understand and explore underlying neurological and physiological correlates of key human behaviors (Hubert 2010). This means that marketers engaged in this type of research must have a basic understanding of the human brain and nervous system in order to hypothesize about neurological reactions to marketing stimuli (Donavan et al. 2016). As a research discipline, neuromarketing is currently in a stage of infancy, continuing to define and develop its theoretical, empirical, and practical latitude (Garcia and Saad 2008; Lee et al. 2007). Growth in the area has been coupled with conflict as many have sought to distinguish between the practical utility of neuroscientific techniques as effective measurement tools and the academic utility such techniques potentially offer in terms of advancing existing theory and findings pertaining to marketing research (e.g., Fisher et al. 2010). Toward this end, Hubert and Kenning (2008) aptly discriminate between neuromarketing as the practical application of neuroscientific technology, and consumer neuroscience as the application of neuroscience to the scientific study of consumer behavior (see also Hubert 2010). While a debate may play out among marketing scholars, the concepts are often used interchangeably, which is our interpretation for this chapter.

2.3 Neuroscience Measurement

2.3.1 Psychophysical

Marketing researchers have relied upon indirect physiological measures of neurological processes long before the advent of neuromarketing as we know it today. Commonly referred to as psychophysical measurements (Camerer et al. 2005; Kenning and Linzmajer 2011), these techniques assess physical responses

emanating from non-brain parts of the body to infer the existence of increased or decreased neurological function, most typically with regard to arousal. Numerous psychophysical procedures have been utilized in marketing research and each has been met with a different degree of success and scrutiny. Among the first to be used were pupillary response measures, which reflect changes in pupil size and are consistent with arousal and more specifically with pleasure (Hess and Polt 1960; Hess 1965). Significant differences in pupil size appear to correlate well with advertising effectiveness (e.g., Krugman 1965; Van Bortel 1968; Hess 1968; Stafford et al. 1970) but critics are quick to point out that pupil size can vary as a function of numerous processes (Watson and Gatchel 1979). Marketing research has also analyzed general eye movement and fixation as indicative of voluntary attention (e.g., Bogart and Tolley 1988; Lohse 1997; Wedel and Pieters 2000; Pieters and Wedel 2004) although some (e.g., Kroeber-Riel 1979; Pieters et al. 1999) remain skeptical about the inferences that can be drawn from a presence of lack of eye fixation.

In turn, galvanic skin response (GSR) measures the amount of resistance or conductance human skin exhibits in response to electrical current on the basis of the idea that increased resistance due to sweat gland activation is indicative of arousal. Marketing stimuli have primarily been assessed for "warmth" or likability using GSR (e.g., Aaker et al. 1986; LaBarbera and Tucciarone 1995; Stayman and Aaker 1993). However, its validity for measuring warmth has been questioned, most notably by Van den Abeele and Maclachlan (1994), who managed to demonstrate that GSR and an alternative measure of warmth, though correlated, gauged different affective responses. Voice pitch analysis has also been used to examine fluctuations of pitch as an indicator of affective (i.e., arousal-based) change. Despite its ability to discriminate well between effective and ineffective approaches to advertising (Brickman 1976, 1980; Nelson and Schwartz 1979; see also Wang and Minor 2008), the construct validity (i.e., ability to measure arousal) of voice pitch analysis was convincingly challenged (Nighswonger and Martin 1981) and subsequent use of the technique was abandoned. However, Wang and Minor (2008) suggest that technological advances in voice-capturing software could reestablish the method's viability. Additional psychophysical measurements that have been used in marketing research include heart rate response (e.g., Bolls et al. 2001, 2003; Lang et al. 2002; Smith and Dickhaut 2005; Watson and Gatchel 1979), vascular activity (e.g., Frost and Stauffer 1987; Sanbonmatsu and Kardes 1988), blood pressure (Camerer et al. 2005), and facial muscle activity (e.g., Bolls et al. 2001; Cacioppo and Petty 1983; Hazlett and Hazlett 1999; Potter et al. 2006). Although variations of these techniques continue to be used by some in marketing research, the prospect of directly measuring neurological processes by means of neuroimaging equipment has proven appealing to a quickly growing number of researchers and practitioners.

Direct neuroimaging techniques are typically subsumed under two broad categories distinguishable both in terms of what they measure and the type of information they provide (Kenning et al. 2007; Plassmann et al. 2007a, b, c), which are focused on measuring electrical and metabolic brain activity.

2.3.2 *Electrical Brain Activity*

The first broad category of imaging methods measures the specific nature of electrical activity occurring in the brain. A distinct advantage of analyzing electrical brain activity is its temporal resolution, specifically its ability to monitor and detect change in neurological function occurring within a matter of milliseconds (Perrachione and Perrachione 2008; Reimann et al. 2011). In contrast, a notable criticism for measures of electrical brain activity is that there is limited (at least in their current form) spatial resolution, or localization of electrical conduction to specific regions or structures of the brain (Kenning et al. 2007). It should be noted that this has been debated extensively by neuroscience scholars. Specifically, some contend that statistical techniques and algorithms can be used to sufficiently isolate sources of electrical activity, a technique referred to as *source localization* (e.g., Koles 1998; Koles et al. 1995). Cook et al. (2011) very recently suggested that source localization can be useful in the context of marketing. Using EEG technology with source localization, Cook and colleagues were able to show that logical persuasive ads elicited consistently higher activity specific to the orbitofrontal, anterior cingulate, amygdala, and hippocampal regions when compared to messages not requiring conscious recognition. For the most part, two related techniques for measuring electrical brain activity have been utilized and scrutinized within the consumer neuroscience literature: electroencephalography (EEG) and magnetoencephalography (MEG).

EEG measures changes in electrical fields of the brain by reading electrical signals as they register with varying degrees of frequency and amplitude across a series of electrodes applied to the scalp (Ariely and Berns 2010). In response to stimuli, the neural axons of billions of neurons produce electrical activity ("evoked potentials") as information is transmitted across neuronal connections. The electrical current produced by this activity possesses a number of frequency patterns, which are frequently referred to as brainwaves (Morin 2011). Previous theory and findings have linked different brainwave frequencies to various neurological processes, enabling researchers to target and measure specific responses to targeted stimuli. For instance, arousal was measured in early research as the relative degree of beta wave frequency (e.g., >12 Hz) to alpha wave frequency (e.g., 8–12 Hz) production (Weinstein et al. 1984). Modern approaches have relied upon the frequency of brain waves occurring around specific points in time, including the N270 and P300 waves (e.g., Ma et al. 2007, 2008, 2010). Among the challenges of effectively using EEG are distinguishing between true evoked potentials and "noise" produced by other electrical signals transmitted by environmental (e.g., computers) and human (e.g., blinking) sources (Kenning and Linzmajer 2011). Along these lines, Vecchiato et al. (2010) express legitimate concern that type 1 errors (e.g., concluding that targeted stimuli produce significant differences in brain activation when in fact they do not) are a frequent occurrence in EEG research due to misinterpreted data, although they suggest that this can be remedied via the use of appropriate statistical correction procedures.

MEG measures changes in magnetic fields occurring as electrical brain activity fluctuates (Ariely and Berns 2010; Kenning and Linzmajer 2011; Kenning and Plassman 2005). Less distortion by the skull makes it possible for MEG to provide superior spatial resolution compared to EEG. Furthermore, the sensitivity of MEG magnets makes it possible to depict the activity of deeper brain structures (Kenning and Linzmajer 2011), although some have expressed skepticism with regard to its measurement accuracy at subcortical levels (e.g., Morin 2011). The cost of employing MEG technology currently far exceeds the cost of EEG and the increased spatial resolution it provides remains inferior to other neuroimaging technologies (Perrachione and Perrachione 2008). Additionally, MEG techniques inherit all the challenges intrinsic to electrical brainwave research, most notably "noise"-producing data unrelated to subject brain activity (Kenning and Linzmajer 2011) and the subsequent potential of committing type 1 errors (Vecchiato et al. 2010c).

Alternative approaches to directly measuring electrical fluctuation in the brain are beginning to emerge but have yet to gain significant momentum within the realm of marketing. Nevertheless, these techniques merit mentioning inasmuch as their future application to marketing research has been recommended and explored. Transcranial magnetic stimulation (TMS) creates a magnetic field capable of administering non-harmful electrical currents to specific regions of neurons, enabling researchers to temporarily disrupt functioning in targeted areas of the brain (Ariely and Berns 2010; Camerer et al. 2005; Kenning and Linzmajer 2011). Researchers using TMS can explore the causal role of brain activation as they are able to experimentally manipulate the existence or the absence of a regional or structural contribution. Like EEG and MEG, the effectiveness of TMS currently remains somewhat limited to (cortical) areas just beneath the scalp. It is also a challenge to isolate the effects of TMS currents to targeted areas, and concerns persist about the potential for adverse effects including seizures and neural tissue damage (Camerer et al. 2005; Kenning and Linzmajer 2011). Brain lesion studies also offer the potential to yield causal inferences pertaining to advertising stimuli (Camerer et al. 2005). For instance, Koenigs and Tranel (2008) demonstrate the promise of marketing research conducted among subjects with documented brain lesions. Replicating earlier findings by McClure et al. (2004), the researchers found that participants with preexisting damage to the ventromedial prefrontal cortex (VMPFC) did not demonstrate a preference bias, while participants with no brain damage showed a clear preference based on brand-related imagery.

2.3.3 Metabolic Brain Activity

A second broad category of imaging methods measures metabolic or energy-consuming processes occurring in the brain (Kenning et al. 2007; Plassmann et al. 2007a, b, c). Despite possessing relatively poor temporal resolution, metabolic analyses afford a high degree of spatial resolution (Kenning et al. 2007; Reimann et al. 2011), enabling researchers to identify activation in specific brain regions or

structures, typically within millimeters of its source (Perrachione and Perrachione 2008). Metabolic measurements can either provide a static, momentary snapshot of neural activation or a dynamic view whereby complex neurological processes can be observed as they unfold. The two techniques receiving the most attention in consumer neuroscience literature are functional magnetic resonance imaging (fMRI) and positron emission tomography (PET).

fMRI relies upon the different magnetic properties of oxygenated and deoxygenated blood to measure the strength of a signal known as the blood-oxygen-level-dependent (i.e., BOLD) signal (Kenning and Linzmajer 2011). Oxygenated blood is consistent with brain metabolism, which occurs as different regions and structures of the brain are activated in response to various stimuli. Reimann and colleagues (2011) suggests that four unique features of fMRI make it particularly useful in research pertaining to consumer behavior: the ability to measure processing as it occurs, the measurement of nonconscious processes that are often missed by traditional self-report methods, differentiation (and localization) of phenomena that research participants struggle to distinguish, and ability to measure competing processes occurring simultaneously. Furthermore, fMRI can and has been used to validate existing measures of marketing effectiveness (Dietvorst et al. 2009).

For all of its benefits, fMRI technology is not without its limitations. Access to fMRI technology is somewhat limited due to its expense and the training researchers need to have in order to utilize it appropriately. Related to this issue, Reimann et al. (2011) voiced concern about a frequent tendency to misinterpret fMRI data so as to wrongly infer brain function from brain activation. For instance, data showing increased activation in the amygdala does not provide a sufficient basis for concluding that participants experienced fear, since the amygdala is also believed to be a neurological center for learning. A number of neuromarketing research firms are utilizing fMRI (Fisher et al. 2010) although the nature and quality of the data they collect and the conclusions they draw from such data remain unexplored. Nevertheless, the ability to observe differential activation of key brain structures affords a seemingly limitless range of research opportunities, leading some (e.g., Morin 2011) to predict that fMRI will eventually become the technique of choice for neuromarketing.

PET measures the gamma radiation produced when radioactive molecules (e.g., fluorine) administered prior to the scan decay in response to gluco-metabolism in the brain (Plassmann et al. 2007a, b, c). A point of origin for the decaying molecules can be estimated within millimeters (Perrachione and Perrachione 2008), providing researchers with a fine-detail spatial estimate of metabolic processes. A major disadvantage of PET technology is its invasive nature. Specifically, because it relies upon the use of radioactive tracers, its use with healthy subjects is generally discouraged (Kenning and Linzmajer 2011; Kenning et al. 2007; Shamoo 2010). Temporal resolution is also limited, and PET equipment can be very expensive. Notwithstanding these limitations, reviews of neuromarketing continue to highlight PET's capabilities while suggesting its potential benefits.

A number of additional techniques can be utilized to provide static images of brain structure. In theory, such images could be qualitatively or quantitatively compared over time, as they often are in traditional medical contexts, to arrive

at important insights about brain functioning (Draganski et al. 2004). Perrachione and Perrachione (2008) compare and contrast these techniques, which include magnetic resonance imaging (MRI) and diffusion tensor imaging (DTI). Neuromarketers and consumer neuroscientists are typically not concerned with static and structural imaging technologies due to the existence and relative accessibility of more sophisticated techniques. When possible, it is preferable to observe dynamic changes in electrical activity and metabolic functioning as it evolves in response to targeted stimuli (e.g., advertisements) as opposed to general structural differences. Nevertheless, it remains a possibility that future research questions in the realm of applied science could be further explored with the assistance of these devices.

2.3.4 Multi-Model Measures

Some suggest that perhaps the greatest benefit can be derived from combining the use of multiple technologies (e.g., Kenning and Linzmajer 2011). For instance, the combined use of EEG and fMRI would enable researchers to identify specific brain structure activation corresponding to the production of electrical brain activity. Increased depth and breadth of data would allow for more detailed analyses while potentially allowing one to distinguish the true effect of marketing stimuli from random noise. The field of neuroscience has attempted to synthesize techniques with impressive results (e.g., Debener et al. 2006). Although it is clearly more expensive and analytically complex to combine techniques, we anticipate that neuromarketing research paradigms will increasingly reflect integration in the future, especially involving a combination of psychophysical and brain activity.

2.4 Neuromarketing Taxonomy

In contrast to the wide array of potential research avenues previously discussed, early work in what we characterize today as neuromarketing has generally addressed a limited number of discernible areas. However, previous attempts to organize these findings taxonomically have yielded inconsistent results. Fugate (2007) subdivides existing neuromarketing research into five broad areas exhibiting clear application to marketing: testing advertising effectiveness (e.g., Harris 2006; Herman 2007; Schafer 2005), testing product appeal (e.g., Britt 2004; Singer 2004), celebrity endorsements (e.g., Mucha 2005), logo/brand selection (e.g., Herman 2005; McClure et al. 2004; Singer 2004; Yoon et al. 2006), and media selection (e.g., Reynolds 2006; Walton 2004). Although intuitively appealing, Fugate's (2007) taxonomy is largely derived from nonempirical sources. Meanwhile, Hubert and Kenning (2008) exclusively focus on peer-reviewed academic literature, which they divide into five different groupings: product policy (e.g., Erk et al. 2002), price policy (e.g., Knutson et al. 2007; Plassmann et al.

2007a, b, c), communication policy (e.g., Ambler et al. 2000; Kenning et al. 2007; Rossiter and Silberstein 2001), distribution policy (e.g., Deppe et al. 2005a, 2007; Plassmann et al. 2007a, b, c), and brand research (e.g., Deppe et al. 2005b; Koenigs and Tranel 2008; McClure et al. 2004; Schaefer et al. 2006; Yoon et al. 2006).

Research completed since Hubert and Kenning (2008) propose that their taxonomy makes it worthwhile to revisit and recategorize extant neuromarketing research. New areas of interest have recently emerged relying on neuroscientific measures, including product appraisal (e.g., Cheung et al. 2010; Schaefer and Rotte 2010; Vecchiato et al. 2010a, b, c), purchase behavior (e.g., Grosenick et al. 2008; Reimann et al. 2010; Stallen et al. 2010), and brand extension (e.g., Ma et al. 2007, 2008, 2010). While neuromarketing is capable of including a wide range of identifiable topics, the need to organize studies for the dual purpose of assessing the current state of the literature and generating novel insights could serve future researchers well. Therefore, we propose a reorganized and updated taxonomy that includes six distinct categories for framing existing research in terms of desired marketing outcomes: consumer attention/arousal, product/brand appraisal, product/brand preference, purchase behavior, memory, and brand extension. While a complete and exhaustive list of all published research within each category is beyond the scope of this chapter, Table 2.1 provides definitions and identifies relevant literature for each of these areas with the following sections presenting brief general overviews and supporting examples.

To begin, a significant strand of neuromarketing research is dedicated to exploring features of marketing stimuli (e.g., product packaging, use of imagery) that capture an optimal amount of consumer attention and arousal. Although terms like attention and arousal are often considered interchangeably, they connote different things. *Attention* refers to cognitive awareness of environmental stimuli while *arousal* denotes an immediate and basic emotional response. In spite of this difference, both attention and arousal signify heightened awareness of, and attention to, external stimuli, and so we consider them separately below but group them together within our taxonomy as an outcome of interest to marketing researchers.

2.4.1 Consumer Attention

Attracting attention toward any form of marketing is perhaps the most basic goal. One such means for assessing attention to the features of marketing stimuli has involved the use of eye movement tracking software and hardware. Fixation target and frequency (i.e., length of time focused on a target, number of fixation targets) can be assessed this way, yielding valuable information in regard to the salient characteristics of stimuli. Most work in this area relies on the use of eye movement tracking systems designed to measure the emotional antecedents (e.g., the element of surprise) and the persuasive consequences of stimuli eliciting a high

Table 2.1 An updated taxonomy of neuromarketing literature

Category	Research focus	Relevant literature
Attention/ arousal	Features stimuli eliciting attention and emotional arousal	Bolls et al. (2001), Daugherty and Hoffman (2014), Gakhal and Senior (2008), Groeppel-Klein (2005), Groeppel-Klein and Baun (2001), Groeppel-Klein et al. (2005), Hoffman and Daugherty (2013), Kroeber-Riel (1984), Krugman et al. (1994), Morris et al. (2009), Ohme et al. (2009, 2010a, b, 2011), Rothschild et al. (1986), and Treleaven-Hassard et al. (2010)
Product/ brand appraisal	Neurological correlates of various marketing-based judgments	Cheung et al. (2010), Daugherty et al. (2016), Deppe et al. (2005a, b), Erk et al. (2002), Kato et al. (2009), Krugman (1971), Ohme et al. (2010a, b), Riedl et al. (2010), Rothschild et al. (1988), Schaefer and Rotte (2007a, b, 2010), Stoll et al. (2008), Telpaz et al. (2015), Vecchiato et al. (2010b, 2011), Yoon et al. (2006), and Yu-Ping et al. (2015)
Product/ brand preference	Differences between preferred and non-preferred brands	Ambler et al. (2004), Boksem and Smidts (2015), Braeutigam et al. (2001), Braeutigam et al. (2004), Coates et al. (2004), Koenigs and Tranel (2008), Knutson et al. (2007), Lin et al. (2010), Marques dos Santos et al. (2016), McClure et al. (2004), Paulus and Frank (2003), Pieters and Warlop (1999), Plassmann et al. (2007a, b, c, 2008), and Reimann et al. (2010, 2012a, b)
Purchase behavior	External and internal influences on consumer behavioral and intentions	Kuhnen and Knutson (2005), Plassmann et al. (2007a, b, c), Reimann et al. (2011), and Stallen et al. (2010)
Memory	Factors contributing to future recall and recognition of marketing stimuli	Ambler et al. (2000), Astolfi et al. (2008), Fallani et al. (2008), Hazlett and Hazlett (1999), Klucharev et al. (2008), Langleben et al. (2009), Rossiter and Silberstein (2001), Rossiter et al. (2001), Rothschild and Hyun (1990), Rothschild et al. (1986), and Vecchiato et al. (2010c)
Brand extension	Neural indicators of successful and non-successful brand extensions	Ma et al. (2007, 2008, 2010) and Stewart et al. (2004)

degree of fixation frequency. However, EEG technology has also been utilized to better understand the dynamics of attention associated with marketing features. For instance, Rothschild et al. (1986) showed participants 18 commercials embedded within an hour of television programming while recording electrical brain activity with EEG. Commercials associated with higher levels of learning produced decreased alpha wave production, a phenomenon believed to be consistent with higher levels of attention. More recently, an EEG study conducted by Treleaven-Hassard et al. (2010) measured attention in terms of the incidence of one particular brain wave, the P3a wave, as participants engaged with interactive and noninteractive forms of television ads. While P3a latency decreased over time in response to brands that were presented in an interactive way, it remained the same for brands portrayed in noninteractive ways, indicating that attention was greater for interactive ad presentation.

2.4.2 Consumer Arousal

In turn, arousal has also been measured in a number of studies as a means of gauging emotional responses to marketing techniques. For example, seeking to establish the superiority of physiological indicators of arousal to more traditional self-report measures, Groeppel-Klein (2005) conducted a series of studies where participants were free to move around a store or a series of stores (i.e., the first floor of a mall). Results indicated that electrodermal measurements, unlike self-reports, were more sensitive to change and were also more accurate in the sense that they could be measured in sync with the perception of targeted stimuli (as opposed to later on). In addition, GSR was used by Gakhal and Senior (2008) to investigate whether the use of attractive and/or famous models served to add additional emotional selling property (ESP) to promoted products. Surprisingly, the authors concluded that "average-looking" (i.e., as opposed to "attractive") celebrities produced more arousal than any other condition, suggesting that fame does more to drive emotional response than physical beauty. In another example, Bolls et al. (2001) combined facial electromyography (EMG) with other physiological indicators of arousal (heart rate and skin conductance) to measure radio listener's emotional responses to advertisements determined to be positive or negative in tone. Ads with a negative valence were found to elicit more arousal than their positive counterparts.

One of the more compelling claims of neuromarketing research is that neuroimaging techniques can be used to identify critical emotional aspects of ads that elude conscious recognition. Ohme et al. (2009) coupled 16-node EEG with facial electromyography (EMG) and skin conductance analysis to assess arousal reactions to an altered scene in a commercial advertisement. Significant differences in arousal were detected by all of these techniques, despite the fact that the altered feature of the ad was not consciously seen. In a related study, Ohme et al. (2010a, b) demonstrated subconscious aspects of ad awareness, using EEG to reveal that an unintended aspect of a Sony Bravia tv ad (e.g., a frog that unintentionally appeared in a frame of the commercial as it was being produced) elicited an unexpected and strong emotional response on the part of consumers to the ad itself. The authors conclude that neuroimaging technologies can provide significant insight to marketing producers as they seek to understand the unintended (and intended) consequences of various ad elements.

In summary, neuromarketing researchers have utilized various techniques, both indirect and direct, to evaluate the neurological correlates of attention and arousal. Though slightly different, attention and arousal share a similar appeal to marketing practitioners, who first and foremost seek to make consumers aware that a particular product or brand exists. Research in this area may benefit from exploring contextual variables that act to either facilitate or inhibit attention/arousal. For example, different modes of media presentation (e.g., print, radio, television, Internet) may rely upon distinct combinations of neurological processes (e.g., affective, cognitive) to increase or decrease arousal/awareness. Comparing and contrasting neural reactions (e.g., brainwave activity, brain functionality) to diverse media types could also provide tremendous insight to advertisers seeking to determine whether or not ads designed for one type of media should be recapitulated for use with another type.

Lastly, cross-cultural comparisons are also needed to better understand how attention and arousal differ as a result of environmental influences.

2.4.3 Product/Brand Appraisal

Once consumers have become aware of a product or brand, attention is devoted to appraising (evaluating) multiple aspects of the product/brand for the purposes of judgment and response. Thus, neuromarketing literature pertaining to product and brand appraisal constitutes a second area of research in our taxonomy.

A recent example of using EEG to test brand evaluations, Vecchiato et al. (2011) sought to explore hemispheric differences arising as consumers appraise pleasant versus unpleasant advertising. Participants were asked to rate the "pleasantness" of commercials they could manage to recall 2 h after viewing a documentary video containing the commercials. For remembered commercials, brainwave activity recorded during the commercial was compared to ratings of pleasantness. An asymmetrical increase in theta and alpha wave activity in the left hemisphere was significantly correlated with ratings of ad pleasantness. When ads were not pleasant, such activity was more evenly distributed between hemispheres.

In another example, a concept known as EEG coherence was utilized by Cheung et al. (2010) to examine whether brand name words elicit a higher degree of mental imagery compared to non-brand-related words. EEG coherence is a measure of intra-hemispheric cooperation between distinct regions of the brain. Cheung et al. (2010) cited previous findings in neuroscience literature to propose that high imagery words should manifest themselves as highly coherent beta wave measurements (i.e., similar regardless of the region where EEG signals are being read). On the basis of this theory, the authors were able to associate a higher degree of intra-hemispheric beta wave coherence with brand name words as opposed to concrete words, which suggests that brand name words evoke a substantially greater amount of imagery.

Advertising theory has suggested that contextual information can implicitly affect one's appraisal of a product or brand. For instance, some have suggested that the credibility of an advertising medium can covertly influence subsequent judgments of an advertisement's credibility, a phenomenon known as the "framing effect" (e.g., Gross and D'Ambrosio 2004; Kahneman and Tversky 1984; Tversky and Kahneman 1981). Using fMRI technology, Deppe et al. (2005a) measured brain activity while asking subjects to judge the credibility of 30 different magazine headlines appearing in magazines that had varying credibility. Substantiating extant theory, activity changes were observed in the VMPFC as participants became more or less susceptible to "framing" information. One implication of these findings is that brands deemed credible are processed in a distinctly different neurological way than their less credible counterparts.

In addition, the way in which ads are appraised for credibility, or trustworthiness, may differ as a function of gender, according to Riedl et al. (2010). fMRI activity was monitored as participants viewed eBay offers and evaluated them in

terms of trustworthiness. The women in this study were found to activate more brain areas, and different brain areas, than men did as they formulated trust-related judgments. Riedl et al. (2010) suggest that these results confirm previous theory (i.e., empathizing-systematizing theory; see Baron-Cohen et al. 2005) predicting gender differences in the processing of information. A notable feature of this study is that it measures perceptions of trustworthiness directed toward unconventional advertisers (e.g., individual eBay sellers), leading us to wonder whether similar results would occur in response to more established, well-known sources of goods and services (e.g., Fortune 500 companies).

Another fMRI study conducted by Kato et al. (2009) provides compelling evidence that different ad types are not created equal in terms of the neurological processes they elicit. Kato et al. (2009) showed 40 participants both political advertisements from the 1992 US presidential campaign and commercial advertisements for two common brands of cola (i.e., Coke and Pepsi) while imaging their brain activity with fMRI. Negative campaign advertisements were found to elicit increased activation in the dorsolateral prefrontal cortex among participants who were influenced by the ad to lower their ratings of a candidate they originally supported. Similar patterns of activation did not occur when participants viewed negative ads for cola, suggesting that commercial forms of advertisement constitute a different type of social stimuli than politically driven persuasive communication. Earlier research by Yoon et al. (2006) may provide some additional insight into these findings. In the Yoon et al. (2006) study, subjects were imaged with fMRI while they evaluated products and people using specific adjectives. When people were being appraised, increased levels of activation were observed in the medial prefrontal cortex (MPFC), but when products were being appraised, activation was higher in the left inferior prefrontal cortex, which is a known processing site for objects. On the basis of these findings, it seems logical to find that political ads (e.g., selling people) and commercial ads (e.g., selling products) elicit different types of brain activity.

Furthermore, a series of experiments undertaken by Schaefer and Rotte (2007a, b, 2010) have explored how characteristics ascribed to brands can influence different patterns of neurological evaluation as evidenced by fMRI. An initial experiment (Schaefer and Rotte 2007a) exposed participants to familiar (e.g., European) and unfamiliar (e.g., non-European) car manufacturer logos traditionally associated with either luxury or value. Consistent with the findings of an earlier study using a similar paradigm (Schaefer et al. 2006), the evaluation of luxury brands was associated with activation in the MPFC and precuneus, while value brand appraisal resulted in activation of the left superior frontal gyrus as well as the anterior cingulate cortex (ACC). In a second experiment, Schaefer and Rotte (2007b) used a similar methodology but also asked subjects to assess each brand in terms of attractiveness, character as a luxury/sports car, character as a brand of "rational choice," and familiarity. Results indicated that brain activity in the striatum was correlated positively with sports and luxury characteristics, and negatively with rational choice characteristics. In a third experiment (Schaefer and Rotte 2010), pictures of pharmaceutical brands were pre-

sented to participants who then completed a semantic differential task (i.e., participants rated a brand regarding pairs of adjectives) while brain activity was monitored with fMRI. Brands loading high on a "social competence" factor showed increased activation in the MPFC while brands yielding high "potency" (i.e., strength) ratings showed decreased activation in the superior frontal gyri, which indicates increased reliance upon working memory processes.

The attractiveness of product packaging has also been shown to affect brain activation. Stoll et al. (2008) measured brain activity using fMRI while participants made decisions about the attractiveness (unattractiveness) of various consumer good packages. An interesting facet of this study was that the authors chose to focus on the *contrast* of attractive to unattractive packages (and vice versa), consistent with consumer choices that often reflect comparisons of multiple products rather than static appraisals of a single product. The authors found that when attractive packages were contrasted with unattractive packages, significant brain activation differences were observed in the occipital lobe and precuneus, regions of the brain associated with the processing of visual stimuli. In contrast, when unattractive packages were contrasted with attractive packages, increased activity was observed in the insula as well as in specific areas of the frontal lobe, regions associated with the analysis of aversive stimuli.

It is clear that various features of products and brands have a notable effect on consumer evaluations. An interesting assumption of this area of research (and related areas of consumer neuroscience) is that aspects of products and packaging vary to determine appraisal while consumer characteristics remain relatively stable. A more holistic approach to studying product/brand appraisal might account for aspects of individual appraisers (e.g., demographic and/or dispositional variables) that contribute to discernible appraisal differences found among consumers. Deeper and broader understanding is bound to emerge as additional aspects of advertising are scrutinized using similar methodologies and techniques.

2.4.4 Product/Brand Preference

As mentioned previously, products and brands are often appraised in comparison to one another for the ultimate purpose of arriving at evaluative judgments. A third research area in neuromarketing directly examines the antecedents of product (brand) preference.

Distinguishing neural activity (both direct and indirect) in response to preferred versus non-preferred brands has been a common approach to this area. For instance, an early study of product preference employed eye-movement tracking technology to compare "chosen" brands to non-chosen counterparts (Pieters and Warlop 1999). An interesting feature of this study was that time pressure was manipulated, such that subjects were either given 7 or 20 s to inspect alternative brand choices. This was done to determine whether eye-movement features (e.g., fixation, saccades) could be used to predict product preference under conditions of time constraint.

Eye-fixation durations were significantly longer for chosen brands, even when controlling for time constraints.

In another example using MEG technology to monitor brain activity during a simulated "shopping trip," Braeutigam et al. (2004) sought to establish a timeline of neural responses to product choices. Consistent with the findings from previous research (Ambler et al. 2004), men seemed to initially (i.e., at 300 ms) activate right temporal cortices (e.g., spatial memory) while women showed increased activation in left posterior cortices (e.g., category-specific knowledge). Beyond 500 ms, both genders activated right parietal cortices when opting for previously bought items, and left inferior and right orbital cortices when choosing less familiar items. Specific brand preferences did not significantly differ as a function of gender, although the neurological pathways by which these preferences were derived appeared to vary, especially early on.

Further evidence of distinct neural correlates for product preference has emerged from fMRI-based research. Paulus and Frank (2003) imaged brain functionality while having participants complete preference judgment trials (i.e., "which do you like better?"), visual discrimination trials (i.e., "which drink is in a bottle?"), and additional null trials in an effort to isolate neural functioning specifically related to preference judgments. Preference judgment trials corresponded to increased activation of the medial frontal gyrus as well as differential activation of the posterior parietal cortex, anterior cingulate cortex (ACC), and left anterior insula. Additional regions of the brain were implicated in a study of clothing brand preference by Plassmann et al. (2007a, b, c). Subjects for the study were recruited from one of the four stores and then imaged with fMRI while choices pertaining to clothing from that store were compared to decisions made about clothing from the other three stores. When clothing from the target store (i.e., the store subjects were recruited from) was presented, an activation network linking the VMPFC, the striatum, and the anterior cingulate cortex (ACC) was observed. Interestingly, clothing from the other three stores activated an alternative neural network associated with heightened analysis and calculation. Overall, the striatum, an area of the brain connected with reward prediction, exhibited the largest activation differences. The value of findings emerging from studies such as those conducted by Paulus and Frank (2003) and Plassmann et al. (2007b) is their ability to focus future product preference research on specific brain functions. Activation in these areas can be studied to compare and contrast response to various types of product packaging and advertising, providing increased precision for those seeking to forecast the success of one or more approaches.

Defining the essence of product (brand) preference has also been undertaken using fMRI. Plassmann et al. (2008) empirically tested the notion that brand preference is driven by the reduction in ambiguity that occurs as individuals become more familiar with a product. Subjects were told to select between preferred and non-preferred travel agencies to "book" trips to dangerous (i.e., high ambiguity) or non-dangerous (i.e., low ambiguity) travel destinations. Brand information appeared to interact with ambiguity information in the VMPFC as well as the anterior cingulate (ACC), regions

of the brain that had previously been linked to brand preference (see Plassmann et al. 2007b). When the subject's favorite brand was among available options, activation differences could be seen in areas of the brain associated previously with product preference. The same areas showed no significant activation differences when the subject's preferred brand was not an option.

Brand preference bias has also been explored with the assistance of neuroimaging methodologies. Replicating a classic brand preference marketing study, McClure et al. (2004) used fMRI to compare the neural activation of participants experiencing anonymous and brand-cued delivery of Coke and Pepsi products. Anonymous delivery yielded a consistent neural response (i.e., regardless of brand preference) in the VMPFC associated with the participant's behavioral choice. Brand-cued delivery led to biased preference corresponding to activation in the hippocampus, dorsolateral prefrontal cortex, and midbrain. An additional replication of this study by Koenigs and Tranel (2008) employed a participant pool comprised of patients with damage to the VMPFC. It was predicted that these patients would not display a preference bias, even when they were exposed to brand information. The results supported this hypothesis, suggesting that the VMPFC plays an integral role in the formulation of brand preferences.

fMRI has yielded numerous insights into aspects of product packaging. In a series of four experiments, Reimann et al. (2010) investigated differences in product preference and neural activation corresponding to aesthetic and standardized forms of packaging. Reaction times of consumers to aesthetic packages were significantly longer, suggesting more effortful processing. Aesthetically packaged products were chosen more frequently than standard-packaged products, even when the standardized packages represented well-known brands. Additionally, higher prices did not deter preference for aesthetic alternatives. Activation differences were present in the nucleus accumbens and the VMPFC, areas of the brain consistent with the perception of rewarding stimuli.

It is important to distinguish research pertaining to elements of product preference from product choice. A notable caveat of each of the studies reviewed in this section is their use of forced choice. Namely, participants were not afforded the option of selecting no alternative, although such an outcome is frequent in real-world settings, and can even occur for products that are highly preferred when unfavorable aspects (e.g., cost, nonnecessity) are determined to outweigh favorable aspects (e.g., aesthetic appeal). The relative importance of each preference aspect likely varies as a function of additional features intrinsic to the person (e.g., individual differences) and extrinsic to the environment (e.g., options a particular store has in stock).

2.4.5 Purchase Behavior

An area of research receiving less attention, relatively speaking, pertains to factors contributing to purchase intent and willingness to pay (WTP). We unite these constructs within our taxonomy under the "purchase behavior" label because both

speak to the willingness of consumers to buy a particular product. For example, seeking to establish the neural correlates of WTP, Plassmann et al. (2007c) scanned the brains of hungry patients using fMRI as they submitted bids for the right to eat a variety of junk foods. Significant activity was observed in the medial orbitofrontal cortex (moFC) as well as the dorsolateral prefrontal cortex (dPFC) as decisions pertaining to WTP were made. Specifically, such decisions reflect some calculation of the maximum amount of resources one is willing to part with in order to obtain a desired product. The authors found support for the notion that the moFC plays a critical role in contributing salient goal information to the decision-making process.

Kuhnen and Knutson (2005) also used fMRI to determine whether neural activity could be used to predict when consumers make optimal as opposed to suboptimal financial decisions. Participants completed the Behavioral Investment Allocation Strategy (BIAS) task, where they are prompted to choose between investing in one of the two stocks or a bond. Choosing the bond predictably resulted in any earnings of $1, while choosing either one of the stocks could yield a number of negative (i.e., loss), positive (i.e., gain), or neutral (i.e., zero loss or gain) outcomes. Following their choice, the "earnings" or "loss" resulting from their choice was displayed along with similar data for the remaining two options. Thus, participants were able to compare the consequences of their choice with alternative outcomes, enabling them to anticipate future success or failure and respond with a conservative (i.e., choose the bond) or risky (i.e., choose one of the stocks) approach. Results indicated that activation of the nucleus accumbens, a reward center in the brain, preceded risky choices, while activation of the anterior insula, an avoidance center of the brain, preceded conservative choices. On the basis of these findings, Kuhnen and Knutson (2005) conclude that alternative neural circuits exist to link anticipation of loss or gain to different types of subsequent choices.

Loss aversion appears to be a critical component of intentions to purchase a product. In part to illustrate aspects of reputable fMRI research, Reimann et al. (2011) explored the effects of loss aversion on buying and selling behavior using activation in the amygdala, an area of the brain associated with the processing of negative emotions, as a neural standard for comparison. Participants were asked to establish and manipulate selling and buying prices for mp3 songs. Significantly stronger activation in the amygdala occurred as consumers considered selling prices as opposed to buying prices, consistent with the theory that loss aversion is connected to negative emotional experience.

Future research in this area may benefit from exploring additional theorized and established antecedents and consequences of WTP and purchase intent. For instance, it is our belief that aspects studied in reference to other areas within our taxonomy may be relevant and insightful, including the role of package design and framing effects such as a product's reputation for being a luxury or standard item. Unfortunately, neuromarketing research pertaining to this area continues to be somewhat sparse and limited both in terms of scope and adapted methodology. Furthermore, it is likely that the usage of additional neuroimaging techniques

would prove valuable. Brainwave analysis using EEG, for example, could reveal intriguing differences in WTP under conditions of necessity (e.g., hunger) and non-necessity (e.g., routine shopping). We suggest that this lack of coherence does not speak to the limited importance or potential of this area, but rather to the need for additional research and development.

2.4.6 Memory

Memory for marketing stimuli has been studied at length using neural imaging techniques. In particular, two distinct aspects of memory have been targeted. *Recall* consists of memory for an advertised product independent of stimuli pertaining to the product. In contrast, *recognition* refers to memory for an advertised product that is primed when consumers come in contact with the product or associated advertisement materials. Research in this area has largely focused on potential antecedents of product memory with the understanding that advertisements containing these important antecedents will successfully prime consumer memory, and by extension motivate product purchasing behavior.

A more recent neuromarketing example includes Vecchiato et al. (2010a) combining the use of GSR, heart rate, heart rate variability, and dense-array (e.g., 64-channel) EEG to monitor and compare the differences between remembered and forgotten TV commercials. All of these indicators were measured as subjects observed a 30-min documentary containing three commercial interruptions. Within a couple of hours, subjects were interviewed and asked to recall the commercials they remembered and provide a pleasantness rating for each of the commercials they were able to remember. EEG differences were observed in theta wave activity, which was higher and localized in the left frontal brain area for remembered commercials. Heart rate and heart rate variability differences also existed, such that both were higher for remembered and/or pleasant commercials than they were for forgotten and/or unpleasant commercials. Meanwhile, no GSR differences seemed to differentiate remembered and forgotten advertisements.

Beyond messaging elements, celebrity endorsers and spokespersons are also a common memory-associated test found within neuromarketing research. For instance, Klucharev et al. (2008) sought to measure the impact of celebrity endorsement of a product compared to a nonexpert celebrity endorsement in an fMRI experiment. Twenty-four female participants viewed photos reflecting two distinct types of celebrity-product combinations. High-expertise combinations consisted of celebrities that fit the product they were matched with (e.g., Tiger Woods and golf clubs) while low-expertise combinations did not. Participants were asked to indicate whether or not they perceived a link between each celebrity-object pair. One day later, they returned to the lab and their memory was measured. Pairs indicative of celebrity expertise elicited activation in the hippocampus as well as the parahippocampal gyrus, areas of the brain associated with memory formation. Furthermore, high-expertise combinations appeared to impact attitudes by means of activation in the caudate nucleus, a structure of the brain that is believed to be involved in trustful behavior, reward processing, and learning.

Further, the impact of high- versus low-sensation-value advertising was examined by Langleben et al. (2009) using fMRI and measures of recognition memory. Public service announcements (PSAs) advocating against the usage of tobacco were manipulated to reflect either high or low amounts of "message sensation value." Eighteen regular smokers were shown eight anti tobacco PSAs (independently rated for sensation value) as well as eight neutral video clips. Following a 5-min delay, the subjects were shown 128 still frames and then asked to indicate whether or not they had seen the ad depicted in each frame. Surprisingly, the researchers found that frames from low-sensation-value ads were better recognized than frames from high-sensation-value ads. Furthermore, whereas low-sensation ads educed greater prefrontal/temporal activation, high-sensation ads were connected with greater occipital activation. The potential implications of these findings are noteworthy. Namely, attention-grabbing ads may actually impede subsequent learning and retention.

In summary, research pertaining to recall and recognition of ads is among the earliest to utilize the benefits of direct and indirect methods of neural assessment. Nevertheless, some question remains as to whether or not neural correlates of product memory are also predictive of more basic desired marketing outcomes. For instance, do discernible differences exist between remembered brands and non-remembered brands at the point of sale? It is our belief that the practical value of research exploring various dynamics of recall and recognition would be substantially enriched in the process of connecting it to both proximal (e.g., purchasing) and distal (e.g., brand loyalty) outcomes.

2.4.7 Brand Extension

The sixth and final dimension of our taxonomy is represented by the neuroscientific study of a unique distal outcome of advertising. *Brand extension* is defined by Ma et al. (2007) as "the use of established brand names to enter new product categories or classes" (p. 1031). The benefits of associating a well-regarded brand name with new and additional products are manifold and well summarized by Stewart et al. (2004). In short, successful brand extension is believed to raise the marketability of new (i.e., previously unused) products while potentially further reinforcing the integrity of existing (i.e., already used) products. Relative to other desired marketing outcomes reviewed and organized in this taxonomy, only a small number of studies examine aspects of brand extension. Nevertheless, the limited research conducted in this area is exemplary in terms of the scientific rigor with which it has applied neuroimaging techniques to answering questions of significance to product advertisers. Furthermore, we believe that a sufficient amount of research remains to be done within this area of neuromarketing to sustain its viability as an independent area of interest.

To this point, Qingguo Ma et al. (2007, 2008, 2010) have almost exclusively accounted for the empirical investigations conducted in this area. Dense-array (64-node) EEG has been their technique of choice, with specific brainwave amplitudes comprising their outcome variable(s). A 2007 study by Ma et al. measured the

amplitude of brain wave N270, a signal that indicates neural processing of conflicting information, as participants observed different combinations of beverage brand names (stimulus 1) and product categories (stimulus 2). As neural activity was being recorded, participants were asked to indicate the appropriateness of extending the brand depicted in stimulus 1 to the category presented in stimulus 2. Low brand-extension conflict was created by combining beverage names with the categories "beverage" and "snack," while high levels of conflict were induced by pairing beverage names with the categories "clothing" and "household appliance." Consistent with prior research on the properties of N270, higher conflict (beverage name-product category) pairs elicited greater N270 amplitudes than low conflict pairs. These findings suggest that advertising research can utilize EEG and the N270 wave to determine when brand extension *is not* occurring.

In 2008, the same group of researchers (Ma et al. 2008) used a similar methodological paradigm to measure differences registered with regard to a second brain wave of particular significance to neuroscientists, P300. In contrast to the N270 wave, the P300 wave is believed to indicate perceptual similarity. Once again, brain activity was measured with dense-array EEG as subjects indicated the suitability of extending a well-known beverage brand to congruent (i.e., beverage-related) or noncongruent (i.e., non-beverage-related) product categories. Congruent brand-name/product-category pairs resulted in significantly higher P300 amplitudes. Thus, like N270, it appears that P300 can be utilized as a neural indicator of brand extension. Unlike N270, however, the P300 wave appears to be consistent with the *successful* extension of a brand.

A more recent study by Ma et al. (2010) measured N270 amplitude in response to brand name/product type pairs, but added an additional element. Prior to viewing and responding to these pairs, subjects were shown and asked to rate a picture that was either negative or neutral in valence. Ma et al. (2010) hypothesized that brand extension would consistently be rejected when negative emotion was induced. Negative emotion was found to have a significant effect on moderate brand extension, such that participants were less likely to extend a brand when they had been shown a negative as opposed to a neutral picture. However, highly similar and dissimilar brand name/product type pairs were not affected by picture valence. The authors conclude that this is the case because highly similar/dissimilar brand/product pairs do not require the amount of active processing that moderately similar pairs require. Inasmuch as negative emotion is believed to inhibit active processing, the findings of this study make intuitive sense.

In summary, scholarly knowledge of brand extension has already been notably enriched through the use of neuroimaging techniques. Research in this area is needed to distinguish between positive and negative forms of brand extension. In particular, it seems that advertisers would want to promote the extension of brands that are positively regarded by the consumer while inhibiting the extension of brands that have been either neutrally or negatively received. Once the specific neural correlates of positive and negative brand extension have been ascertained, further research could experiment with interventions intended to facilitate or stem the brand extension process.

2.5 Conclusion

The use of neuroscientific research methods can provide marketers with the means to better analyze and understand consumer behavior. These technologies and associated techniques have helped usher in a new renaissance known as neuromarketing. However, we contend in this chapter that the full potential of neuromarketing to meaningfully contribute toward our understanding of consumer behavior has yet to be unlocked. Thus, we attempted to accomplish three goals. First, we provided a practitioner-oriented explanation of common neuromarketing techniques. Second, we updated a contextual framework for neuromarketing research, reclassifying research in terms of targeted marketing outcomes. Third, we have provided numerous suggestions for future research designed to help move the discipline forward.

Although an incredible amount of potential exists for continued exploration and refinement within neuromarketing research, it is our belief that the most intriguing possible avenues for future work exist beyond the purview of the areas previously identified. Meaning, rather than focusing neuromarketing as primarily a measurement paradigm of research, marketers must begin to embrace neuroscientific techniques to confirm, challenge, and construct marketing theory associated with brain activity and the cognitive processing of marketing sensory information. A strong theoretical foundation could reaffirm neuromarketing as a research discipline while contributing greater depth for understanding consumer behavior.

While neuromarketing continues to receive recognition among academics and practitioners, there remains concerns. For instance, a variety of ethical questions have been raised in response to the introduction of neuroscientific measurement techniques associated with commercial for-profit use. First and foremost among them is the issue of personal privacy (Kenning and Linzmajer 2011). Uninformed participants are apt to fear exploitation of their thoughts and feelings and/or violation of their personal autonomy (Murphy et al. 2008; Wilson et al. 2008). Early media attention on neuromarketing is at least in part responsible for this suspicion, propagating fear that people possess a neurological "buy button" that marketers can willfully manipulate without consumer consent to achieve desired gains (e.g., Blakeslee 2004). Walter et al. (2005) note that many if not all of the ethical issues associated with neuromarketing could be easily posed to any form of marketing research. Nevertheless, the need for a guiding code of ethics is clear. Murphy et al. (2008) provide a helpful ethical framework for consumer neuroscience, suggesting provisions that address full disclosure of goals, risks, and benefits as well as the protection of research participants and potentially vulnerable "niche populations." Substantial assistance in developing ethical provisions can be found by consulting neuroscience and neuroethics literature, which reflects attempts on the part of other disciplines to identify and attend to similar issues. These concerns underscore the importance of approaching neuromarketing with careful and deliberate scrutiny and the continued need for research to be conducted openly and made readily available for the public.

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Chapter 3
Topoi in Neuromarketing Ethics

Cristian Ducu

Neuromarketing is regularly labeled as an *emerging field* of research and applications. Some authors feel the need to argue that its story begun in 1957, with James Vicary's claims of subliminal manipulation of cinema passive screen-watchers in order to eat more popcorn and drink more Coke, or with Vance Packard's The Hidden Persuaders, a book questioning the morality of the advertisers that aimed to compel the consumers' most intimate needs to make them buy more products. Others place it more recently, in the late 1980s, when Dr. David Lewis-Hodgson launched his MindScan,[1] or early 1990s, under the influence of Gerald Zaltman from Harvard Business School. Still others credit Ale Smidts for coining the term "neuromarketing" in his inaugural address held at the Erasmus Research Institute of Management on October 25, 2002 (Smidts 2002),[2] and prefer to link the rise of this field/topic with the first companies that provided "neuromarketing services" and the boom in the scientific literature, i.e., the early 2000s. According to S. Matthews (2015, p. 1635), who cites Plassman et al. (2012), "in 2000, there were no peer-reviewed articles, no Google hits, and no neuromarketing companies. In 2004, there were 5000 Google hits, climbing almost vertically up the y-axis. In 2010, there were 250 published articles and 150 neuromarketing companies."

[1] He is the first researcher whose work in what we now call neuromarketing was featured in mass media. In 1991, BBC TV's *Tomorrow's World* covered extensively Dr. Lewis' technology called MindScan, a basic EEG device, and his "Index of Cortical Arousal", an interpretation matrix.

[2] A press release from June 3, 2002, announced that BrightHouse Institute for Thought Sciences, an advertising company from Atlanta, USA, "made a giant step in the Neuromarketing industry by identifying sections of the brain that respond to preferences" ("Brighthouse Institute for Thought Sciences …" 2002).

C. Ducu (✉)
Centre for Advanced Research in Management and Applied Ethics, București, Romania
e-mail: cristian.ducu@etica-aplicata.ro

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Leaving aside this historical interest, the significant idea is that the neuromarketing laboratory work and real-life applications are still in their infancy, with plenty of things to be tested and correlated with data and results from other fields like neuroeconomics, economic behaviorism, consumer psychology, dynamics of complex systems and neurobiology. And this incipient level of development comes not only with a lot of challenges regarding the complexity of the brain research itself, but also with a multitude of confusions, misunderstandings and loose interpretations surrounding it. Mainstream and new media are only partially responsible for them; the other side is determined by the language and the claims researchers and practitioners themselves are making about what this field can deliver. In the second part of this chapter, where I begin my ethical journey, I will try to show that one key ethical concern is related to these claims, which I will call them generically "overclaiming". Most of the authors that write on ethics in neuromarketing emphasise these concerns and highlight the idea that they contribute to the negative public reactions. For example, in 2007, three researchers—Marco Iacoboni, Joshua Freedman and Jonas Kaplan—published an opinion editorial in New York Times pretending that their research on *20 subjects*, swing voters, showed *a direct link* between activation of certain regions in the subjects' brains and their political preferences (Iacoboni et al. 2007). Their op-ed was an opportunity for a lot of people to raise a significant number of concerns regarding the use of fMRI in marketing campaigns and political communication (Aron et al. 2007). Some even argued that consumers are *manipulated* by neuromarketers (Ruskin 2003).

3.1 Preliminary Distinctions

Before opening the arena for the ethical concerns regarding both neuromarketing research and its applications, we need to clarify some fundamental elements. First one refers to what neuromarketing is, while the second covers the relationship between this field and bioethics in general, and neuroethics in particular. This introductory part does not consist in something new, unknown to those that work in the field of neuromarketing, but it is essential for the position I adopt later on.

3.1.1 Neuromarketing: From Research to Applications

The first question we need to ask is if neuromarketing represents a new, broader, field or just a different perspective of the same thing, and, consequently, is just a subdivision of marketing or other discipline. There are authors that consider neuromarketing some sort of new, interdisciplinary but still independent field because its subject matter is not human economic behaviour per se, but the internal mechanism that determines economic behaviour. By investigating the brain activity, the neuromarketer is trying to explain why, for instance, in front of a shop shelf, we choose one thing over another. The explanation makes use of information obtained via

neuroimaging techniques and/or biometric measurements, i.e. unmediated, and this differentiates it from the classical market research, where the investigation involved either direct contact with the research subject or behaviour observance.

For Pop et al. (2014), neuromarketing emerged from neuroeconomics and gained momentum until it became an independent science. This statute should not only provide an autonomy concerning its subject and tools, but also come with some specific ethical issues.

Others consider neuromarketing not a discipline per se, but just a different approach to the same subject matter. In this logic, neuromarketing is opposed to traditional market research, which failed to deliver the imposed level of effectiveness for marketing practices. From this perspective, those who study market research should learn not just about focus groups, questionnaires, etc., but also about fMRI, EEG, ET, GSR, etc.

In terms of ethical approach, this distinction sets apart two different perspectives: one that grants the idea that ethical concerns are mostly specific to this field, and the other that recognises a multitude of ethical questions, borrowed from medical literature, from research methodology, or from business ethics. I favor this latter perspective.

The second issue we have to take into account is the ambivalent nature of neuromarketing: it can indicate both the neuromarketing *research* and its *applications*. The research is reflected in studies published in scientific journals or books, or developed for particular clients. The applications involve marketing and advertising practices informed by the neuromarketing research. This distinction is critical because there are studies which are not done for practical reasons, while we cannot speak of neuromarketing applications in the absence of neuromarketing research. Ulman et al. (2014), based on Hubert and Kenning's (2008) distinction, propose to distinguish two main research domains: (1) "consumer neuroscience", which is academic in nature, and (2) "direct application of the neuroimaging techniques for sector-specific aims". According to them, this sector-specific research has been the central issue in several ethical debates within the societies, and not the first one (Ulman et al. 2014, p. 1). I will make use of this distinction between neuromarketing *research* and neuromarketing *applications*, but not as introduced by Huber and Kenning (2008).

3.1.2 Neuromarketing Ethics: Neuroethics—Bioethics

As I was saying earlier, the public reactions towards neuromarketing were and still are adverse. But the academic reflection over the ethical limits of neuromarketing did not sprung from these public debates. Their source can be traced in the bioethical tradition, where questions like protection of human research subjects, informed consent, privacy and autonomy are common topics, and where ethics in neuroscience was developed in the same period of time when neuromarketing was making its way out. Consequently, we don't need to wonder why there are overlapping ethical concerns between neuromarketing ethics, bioethics and what is now called "neuroethics".

Even so, neuromarketing ethics is not a subfield of bioethics. Their subject matters are totally different. Bioethics, for instance, is not interested in the ethical aspects of human economic behaviour, but in any ethical question arising in the life sciences.

In a brief note following several conferences on ethics in neurosciences held in the USA and the UK in 2002, Adina Roskies used a classical philosophical *locus communis* to account for two "main divisions of neuroethics". This *locus communis* distinguishes between doing (applied) ethics (with the help of a few tools from neuroscience) and thinking about the ethics of ethical research. Accordingly, Roskies talks about (2) the *neuroscience of ethics* and (1) the *ethics of neuroscience* (Roskies 2002). The first branch of this division (2) investigates how moral judgment forms in human brain, and what neural mechanisms are involved in ethical behaviour. In this respect, it is similar to the way neuromarketing studies the neural mechanisms involved in economic behaviour.

The latter, i.e. *the ethics of neuroscience*, is divided even further by Roskies (2002), between (1.1) "the ethics of practice", where the focus is on "the ethical issues and considerations that should be raised in the course of designing and executing neuroscientific studies", and (1.2) "the ethical implications of neuroscience", where this means the "evaluation of the ethical and social impact that the results of those studies might have, or ought to have" (Roskies 2002, p. 21). In her opinion, these ethical implications are "the area of the neuroethics that is truly novel" (Roskies 2002, p. 21). The ethics of practice is actually *research ethics* applied to neuroscience, where the focus is on how these studies are designed and conducted from a moral perspective; the ethical implications of neuroscience look at the applications of these studies in real world, just like the applications of neuromarketing going through an ethical assessment to circumscribe the impact on business practices (Table 3.1).

Table 3.1 Neuroethics vs. neuromarketing ethics (adapted after Roskies 2002)

Neuroethics	Neuromarketing research	Level
2. The neuroscience of ethics (ethical behaviour)	2. The neuroscience of consumer behaviour	Neuroscience
1. The ethics of neuroscience	1. The ethics of neuromarketing	–
1.1. The ethics of practice (/the research ethics of neuroscience studies)	1.1. The ethics of neuromarketing research (/the research ethics of neuromarketing studies)	Research ethics • *Ethics in research governing* • *Ethics concerning the use of neuroimaging technology* • *Ethics in neuromarketing research publications*
1.2. The ethical implications of neuroscience (studies)	1.2. The ethical implications of neuromarketing studies	Ethics of applications

3.2 Mapping the Territory

This chapter and, in fact, this entire volume are not meant to offer a comprehensive ethical assessment of neuromarketing, but rather to provide a brief map of the ethical concerns associated with this field. From a modest point of view, the role of this cartographic work is not to inform any public policy or ethical standards; instead, it is to set a clearer background for a professional debate about ethics in neuromarketing research and applications. This part of my chapter is structured on three main directions developed based on the preliminary distinctions. These directions are (Sect. 3. 2.1) ethics in neuromarketing research; (Sect. 3.2.2) ethics of the use of neuroimaging technologies in neuromarketing studies; and (Sect. 3.2.3) ethics of neuromarketing applications.

3.2.1 Ethics of Neuromarketing Research

Neuromarketing is first and foremost a research field, where various research practices and tools come together to construct a theory or a model that explains the economic behaviour of humans from an *internalist perspective*, i.e. by informing us about the neural correlates of consumer behaviour in particular (not economic behaviour in general). This statute brings in a series of ethical limitations, most of them common to any biomedical research field, that should be discussed not only by ethical experts, but also by neuromarketers and marketing practitioners. My mission in the following sections is to introduce these ethical limitations. All of them are important for what is usually called "good governance of research".

3.2.1.1 Ethics in Neuromarketing Research Governance

Every time when a research fraud or research misconduct is discovered, the entire scientific community, worldwide, reacts and asks for better governance of research institutions, programs, and projects, especially when these acts involve countries that have lower ethical and legal standards for research or none at all, or researchers that come from these countries. But the reality is that if someone wants to publish a study in a Western journal or get funding from a Western scientific institution, it will be difficult to do so if he/she conducts the study in a country with more "flexible" standards without observing the more "rigid" norms from the country where his/her research will be sponsored. The globalisation phenomenon has left its mark not only on economic trade, but also on the scientific communities: more and more codes of ethics for research conduct are being adopted all over the world, with almost similar values, principles and norms; more time is allocated to research ethics training for scientists and support staff; more tools are being developed to uncover unethical research practices; and more people are interested in checking facts in other people's studies.

For the purpose of this book chapter, I will leave aside scientific fraud and focus more on topics that reflect the particularities of neuromarketing research. Scientific fraud is usually difficult to discover and needs a special insight concerning the study or the project at stake. Consequently, I will concentrate on three different aspects of research conduct: (a) scientific dishonesty concerning what neuromarketing studies can deliver; (b) ethical aspects concerning selection and participation of individuals in the neuromarketing research; and (c) informed consent.

How Much Can We Really Say from a Neuromarketing Study?

In their seminal research on the print coverage of brain imaging, Eric Racine, Ofek Bar-Ilan and Judy Illes noted "an overall optimism for this frontier neurotechnology", where "clinical research is presented more optimistically than nonclinical research, and scientific concerns are featured more often than ethical ones" (Racine et al. 2006, p. 134). At the same time, they concluded that the "disequilibrium between coverage of non-health-related research and clinical benefits suggests that non-health-related research is galvanising the ethical debates surrounding neuroimaging". One of these non-health-related research areas is represented by neuromarketing. For example, in 2004, the editorialist of Nature Neuroscience published a short text called "Brain Scam?", where he/she was mentioning the fact that "the prospect of big corporations or political lobbyists enlisting brain science to manipulate consumer and voter behavior has inevitably raised concerns" (Nature Neuroscience 2004).

In the same year, Sam Jaffe was writing a similar opinion against those that use fMRI to demonstrate that measurements in blood flow can be unmistakably correlated to our decisions or behaviour. As he put it:

> Whereas it might take milliseconds to decide to place a bid on that Hello Kitty lampshade on eBay, it can take minutes for blood to flow to that area, during which time billions of other neural actions have occurred. Is the fMRI scan really measuring the bidding decision, or is it showing the artifacts of other brain activities? For the most part, neuroscientists simply can't effectively answer that question. (Jaffe 2004)

What Jaffe condemns in his paper is generically called overclaiming. And it is not uncommon in this field, as we would like to think about scientific research. In fact, most of the applied studies contain some sort of statements that either present the capabilities of the neuroimaging in a favorable light or misrepresent its limitations. Moreover, it would be very interesting to see if these statements are particularly correlated with some sort of economic interest on the behalf of those doing the research or not.

The problem with overclaiming is that it generates some expectations which are not related to what the research itself can reasonably deliver and, in this regard, it represents a *confidence trap*. In other words, the scientific nature of the neuromarketing research plays the role of a bait that tricks the marketing practitioner and people in general into accepting expensive studies, which should produce a more reliable insight than the traditional focus groups or surveys.

In order to make overclaiming practices evident, I have chosen two examples that speak for themselves:

A. The most notorious overclaim is represented by a folk reading of Martin Lindstrom's "Buyology". In that book, he uses the phrase "buy button" to refer to a mechanism existing in human brain that can presumably predict consumer decisions and behaviour. While he is quite reserved about the physical identification of this mechanism, Lindstrom manifests some sort of enthusiasm about it. And because of this enthusiasm in using neuroimaging technologies to uncover consumer choices, he is generally regarded as a supporter of the idea of a "buy button" (Ariely and Berns 2010, p. 4).

Frankly speaking, the concept is very appealing for marketing practitioners, especially because it is a simplistic explanation of consumer behaviour and promises to deliver something unmatched by traditional market research tools. Essentially, the "buy button" folklore says that the human brain contains some particular regions whose function, if properly understood, can convey the consumer's most intimate desires and choices. Consequently, having this insight knowledge, the marketing and advertising industries will know which button to push in order to change the consumer's behaviour towards buying a certain product.

As Dan Ariely and Gregory S. Berns (2010, p. 4) have already mentioned, today, we know that this folk idea is completely false due to the complexity of the cognitive processes associated with consumer's evaluations and decisions. First of all, locating the "buy button" in a single brain region would be totally contrary to what we know about brain activation: the human mind is not like a board of lights where we can switch on or off sections according to a particular desire; instead, we deal with a myriad of neural structures firing simultaneously or successively in various parts of the brain, connected or not. All recent studies using fMRI, as far as I know, present a highly complex picture of this, where various regions become active during a purchase decision: from the insula to orbitofrontal cortex, from hippocampus and amygdala to striatum (Haber 2011; Ariely and Berns 2010; Yarkoni et al. 2011).

In a New York Times op-ed, Martin Lindstrom went even further claiming that in an fMRI experiment he carried out with the help of a US neuromarketing company, 16 subjects—8 men and 8 women, with ages from 18 to 25—showed a "flurry of activation in the insular cortex of the brain" when they heard the sound of their phones. In his opinion, this activation, commonly "associated with feelings of love and compassion", indicates that the "subjects' brains responded to the sound of their phones as they would respond to the presence or proximity of a girlfriend, boyfriend or family members", but without "demonstrating the classic brain-based signs of addiction" (Lindstrom 2011).

Lindstrom's text managed to stir a lot of people in the scientific community, just like Marco Iacoboni, Joshua Freedman and Jonas Kaplan's 2007 op-ed (Iacoboni et al. 2007; Aron et al. 2007), who attracted virulent reactions from researcher and general public. One recurrent argument coming from his opponents was related to the fact that insula is not associated only with love and compassion, but also with pain (Hayden 2011). Secondly, the ethical concern related to this folk idea is that it creates

a false imagine about neuromarketing research. A neophyte marketer may be inclined to ask for things impossible to obtain from a neuromarketing study. From this perspective, the neuromarketing researchers should practice a more balanced attitude towards their field of expertise and the results of their work. The Code of Ethics of NMSBA contains an explicit clause regarding this issue: "Neuromarketing findings shall be delivered to clients without exaggerating or misrepresenting the neuromarketing insights beyond what is scientifically accepted" (Addenda A.1, Article 1.c).

B. The second example is taken from C. Dragoș Cîrneci, Alin Angheluță and Delia Gheorghe's paper "The Use of Neuromarketing in the Study of Brand Related Mental Processes. Case Study—Romanian Food Brands" (2014), where authors make several blunt overclaims. Here are just three of them:

> Neuromarketing tools give insights not only into what that person is thinking, but more importantly, into how they're reacting to a specific product or advertising—subconsciously. (Cîrneci et al. 2014, p. 331, repeated on p. 339)

> We found a significant correlation between consumption of Aldis products and cerebral activations in areas responsible with processing emotion and personal relevance, respectively. (Cîrneci et al. 2014, p. 339)

> The activation of this brain structure in our study at the presentation of certain food package proved to be a reliable predictor of the consumption habits of the participants. (Cîrneci et al. 2014, p. 337)

First, it should be noted that neuromarketing tools, whatever brain imaging technology and conceptual matrix is being used, cannot "give insights … *into what that person is thinking*" (my emphasis). To do that, the "neuromarketing tools" should be able to interpret bioelectrochemical reactions into explicit *thoughts*.[3] Any honest researcher familiar to fMRI technology knows that seeing on a computer screen, in controlled laboratory conditions, a single or a bunch of neurons firing in the anterior cingulate cortex, for instance, does not equate to saying that the subject "thinks" about rewards like money, sport cars or sex. Also count "there are about 90,000–100,000 neurons under 1 mm^2 of cortical surface" (Logothetis 2008, p. 875), not 1, not 100 nor 1000 (cf. Illes et al. 2006).

To this we should add that we still know very little about the functionalism of the human brain in order to conclude that there is a determinant connection between certain area of the brain or neural pattern in a certain region and human behavior. As Logothetis (2008, p. 869) says, "fMRI is not and will never be a mind reader". The colorful pictures of the brain produced by fMRI are far from telling stories about what is going on in those cortical processes.

[3] The barrier between the physical processes in the brain and what we call thinking, thoughts, ideas, preferences and so on—mental processes—is still the main problem of any neuroscience investigation. Stating, without any reasonable doubt, that x activations of the brain represent the *t* thought is nonsensical because it implies that we can establish a direct link between those two elements, which so far neurosciences were unable to do. We are still in the guessing business, where, based on previous localised experiments, we eliminate certain functions and infer that the remaining activations represent what we were looking for (an emotion, a thought, a word, etc.). It will also mean that we can discriminate among the myriad of functions we assign to specific brain regions.

Second, the idea of giving insights into the subconsciously is even more problematic. These researchers should be able to correlate beyond any doubt, for example, the memory of a rose perfume with a certain activation of the insula that we can convincingly say that it is subconscious and not conscious, in particular if that memory brings back also pleasant emotional reactions (e.g. maternal sentiments, sexual arousal).

Third, let's say that the subject is in front of a supermarket shelf full of shampoo brands: these researchers should be able to demonstrate that looking at the activation of a certain region in the medial insular cortex when he/she sees the product or senses the rose fragrance *predicts* the fact that he/she has a certain consumption *habit*. Moreover, that he/she is inclined to reach the product and put it in the shopping basket.

Researchers that make overclaims in their papers are contributing in a high degree to the negative image of this field because their writings are the basic level of information for media and the entire scientific and professional community. One professional or industry-based code of ethics like the one of NMSBA is definitely not sufficient to secure a better reputation for neuromarketing.

Overclaiming is a problem not only for scientific research, but also for neuromarketing consulting companies and professionals. When a neuromarketing consultant misrepresents the capabilities of the technologies he/she uses, we deal with a blunt deception of the client. At the same time, it is a misrepresentation of his/her capacities because he/she promises something that he/she knows that it cannot deliver. In other words, overclaiming is both a topic of business ethics—company-client relationship—and of professional ethics: the ethics of neuromarketing *consultants*. In both cases, we do not need to invent something new to respond to these challenges: both business and professional ethics can provide guidance in respect to overclaiming, which is generally regarded as an unethical business practice. In other words, overclaiming is a form not only of scientific, but also of professional and business dishonesty.

Governing Research Subjects' Participation in Neuromarketing Studies

All neuromarketing research is based on investigative methods that involve live human subjects. This characteristic introduces the idea that neuromarketing researchers should be responsible and accountable for the way they select and treat their subjects. But the main problem is that neuromarketing involves non-clinical use of neuroimaging and biometric technologies, and in many cases no public funding is involved[4] nor IRB ethical approval or clearance is required. How are we going to make neuromarketing researchers accountable for failing to protect the rights and welfare of their research participants in these situations is unclear.

Although there are authors that believe that there is no regulatory framework[5] to solve this problem (Murphy et al. 2008; Ulman et al. 2014), the fact that we have

[4] In many countries, the funding programmes have specific regulations for research conducted on human and animal subjects. The USA and Europe are pioneers in this respect.

[5] The notable exception is France, where Law no. 2011-814 of July 7, 2011, title VII ("Neuroscience and Neuroimaging"), introduced in the bioethics national regulation a new article, no. 16-14,

a wide range of normative and non-normative national[6] or international documents[7] that aim to protect research subjects and patients, the fact that neuroimaging technologies are considered medical devices all over the world (not only by FDA in the USA) and, consequently, go through an approval process, and the fact that there is a code of ethics for the neuromarketing industry (NMSBA Code of Ethics) should be sufficient to extend the ethical considerations to neuromarketing research. In case these are considered irrelevant and neuromarketing research is not assimilated to biomedical research or scientific research in general, we need to get back immediately to the fundamental ethical principles that should govern researcher's work, ensuring that the non-maleficence principle ("do not harm") covers it (NMSBA Code, article 2, (a) and (b), as well as article 8). The underlying moral value here is human dignity, which compels the researcher to treat his/her subjects not as mere means to a scientific or commercial goal. In this regard, the whole literature on research involving human subjects seem to agree on the importance of human dignity and the moral principles based on it (the beneficence and non-maleficence principles). So, even if there is no regulatory framework, i.e. legally binding set of norms, we are still left with a fundamental set of moral rules to govern neuromarketing research.

Having set this baseline, I want to emphasise only three main ethical concerns related to the use of human subjects in neuromarketing research. The first one refers to the enrollment practices for research participation. Having a general research policy ("a protocol") is not sufficient to say if a neuromarketing study was done in accordance with the highest ethical standards. This is why we need various tools at the level of those entities that conduct neuromarketing research to ensure that human participants are selected in a way that is both objective and does come with further consequences for them and for the research project itself. For example, is it ethically correct to use schizophrenic patients in a neuromarketing study, subjecting them to commercial content? Or is it ethically sound to derive general conclusions about human consumer behaviour based on research that employed a racially enrollment practice (for example, involving Asian individuals from a particular city in Europe or America)? Or by targeting homeless individuals because their capacity to decide for themselves is considered lower than in other social categories?

This leads me to my second ethical concern, which is the use of vulnerable individuals in neuromarketing research, for scientific or commercial purpose. This topic is highly discussed not only in neuromarketing literature, but also in research ethics literature in general.

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which makes legal only those neuroimaging techniques that serve a medical, scientific or judiciary purpose. Commercial use of neuroimaging is not explicitly banned, but it is excluded by the previous legal phrasing.

[6] For example, in the USA: the Federal Policy for the Protection of Human Subjects (the so-called Common Rule or HHS 45 CFR part 46); Presidential Commission for the Study of Bioethical Issues 2011. In Europe: Oviedo Convention from 1997 (Council of Europe 1997), the European Textbook on Ethics in Research (European Commission 2010), and all the local and institutional regulations concerning ethics in research.

[7] Declaration of Helsinki, paragraphs 9 and 17; Council for International Organizations of Medical Sciences 2002.

The initial question for this discussion is related to what stands for "vulnerable individual", what is the meaning of "vulnerable" in research context. Even if "the definition of vulnerability remains contentious", the authors of the European Textbook on Ethics in Research (European Commission 2010, p. 52) consider that there are sufficient elements to help us identify vulnerable research subjects. And indeed there are. For example, CIOMS describes vulnerability as a "substantial *incapacity to protect one's own interests* owing to such impediments as lack of capability to give informed consent, lack of alternative means of obtaining medical care or other necessities, or being a junior or subordinate member of a hierarchical group" (Council for International Organizations of Medical 2002, p. 18—emphasis added). For CIOMS, vulnerability is mainly a matter of internal factors—a special capacity that makes us pursue our own interest. In 1998, David N. Weisstub explains vulnerability almost in the same terms, as "an inability to protect oneself from exposure to an unreasonable risk of harm" (Weisstub 1998). From this point of view, vulnerability is closely connected with the concepts of moral agency and competence. Phil Bielby talks in his book Competence and Vulnerability in Biomedical Research (2008) about five types of competence: (1) agency competence; (2) task competence; (3) decisional competence; (4) societal competence; and (5) legal competence. Based on this distinction, we can have the following categories of vulnerable individuals or groups (Table 3.2):

Patients, students and employees are particularly important for this discussion because the last 70 years of biomedical, but also psychology, research has taught us that researchers are always tempted to use ethical shortcuts to get to the results they are interested in. From the Stanford Experiment, done on graduate students from Stanford University, to clinical trials conducted on patients desperately searching to gain access to experimental drugs or on students willing to get an extra dollar by participating in their professors' studies, we have learnt that ethical protocols are insufficient to uphold the highest ethical standards in laboratories and research departments. There is a need for a deeper understanding of the ethical issues faced in research by researchers themselves; there is a need for understanding which class of individuals represent a vulnerable group for x or y research project and why.

For a better illustration of this situation, take the following example extracted from a neuroscience study:

> Data were collected from 76 experimental sessions in 31 patients with pharmacologically intractable epilepsy (27 right handed, 17 male, 17–54 yr old). Extensive noninvasive monitoring did not yield concordant data corresponding to a single resectable epileptogenic focus. Therefore, they were implanted with chronic depth electrodes for 7–10 days to determine the seizure focus for possible surgical resection. Subjects sat in bed facing a laptop computer on which pictures were presented. They were instructed to respond whether the image showed a person or not by pressing the "Y" and "N" keys, respectively. […] Presented images consisted on photos of famous and nonfamous persons, landmarks, animals, and objects. (Ison et al. 2011)

The authors mention that all *patients* signed informed consent forms to participate in this particular study and the research was cleared by the IRB of the University of California. The literature on vulnerable research subjects also discusses the asymmetry in consent: a patient is more compliant with the requests of his/her physician

Table 3.2 Categories of vulnerable research subjects (adapted after Bielby 2008)

Type of competence	Reason of vulnerability	Vulnerable individuals/groups
1. Agency	It lacks the necessary moral agency statute to act in its best interest	1. Fetuses and neonates
		2. Individuals in coma or persistent vegetative state
		3. Individuals in highly advanced stages of dementia
2. Task	It lacks the ability to take care of basic daily tasks, with moral consequences	1. People that by reason of age, infirmity or disability are unable to take care of personal needs
		2. Mentally ill individuals
3. Decisional	It has a diminished capacity to decide what it is in its best interest	1. Children
	or	2. Elderly people with mental disorders
	It lacks the ability to refuse	3. Patients
		4. Students
		5. Employees
4. Societal	Due to societal factors, the individual is in a position where he/she does not have the competence to accept or to reject to participate in a research	1. Women, and especially pregnant women
		2. Unrecognised ethnic minorities
		3. Displaced people (e.g. refugees)
		4. People with limited education or illiterate
		5. Victims of human trafficking or sex workers
		6. LGBTQIA communities (LGBT; drug users)
5. Legal	Its legal status involves a situation where the individual does not have the competence to accept or reject	1. Convicted individuals and prisoners

(compared to a physician or researcher they never met before) because of the trust relationship between them, and this introduces a flaw in the consent itself. So, it is highly important to see not only that informed consent was obtained (a legal constraint), but also by whom and in what conditions.

There is also a different approach of the use of vulnerable individuals and groups in neuromarketing, where they serve as research subjects for future applications. For this particular reason, we should also wonder about the ethical soundness of neuromarketing studies that target to influence negatively the consumer behaviour of vulnerable groups, in particular children, which is to promote consumerism. In a simpler phrase: we use children in neuromarketing research to learn about their attention patterns and, consequently, develop communication campaigns and products that are more appealing to them and that make them buy more and more (for instance, buying more Coke or video games). So, in this particular context, do we have strong moral grounds to reject this type of research (i.e. involving children) or are we in fact practicing some sort of hyper-morality that will lead eventually to an unfair moratorium on neuromarketing research?

The third and last issue is related to the payments and incentives offered to research participants. I do not know any country that considers this enrollment practice unethical and/or illegal. Actually, the money received by those taking part in neuroscience or neuromarketing studies do not exceed US$50. Generally, the research budgets are not too generous with these enrollment-incentivising practices. In my opinion, the ethical issue of these practices actually relates to the status of the research subjects: Is it a way to increase enrollment and raise the threshold of relevant data or is it a way to increase enrollment and make informed consent more binding for the participant (by inducing the idea that he/she was paid to participate, so redrawing will mean to give back the money)? Imagine a situation where research participants are women between 30 and 50 years, from a specific US urban area, with children (1 or 2), and they receive US$50 to participate in a study related to their consumer preferences in a given hypermarket. Is this situation similar with the one where women, 30–50 years, from a Romanian rural area, with children (1 or 2), receive US$15 to participate in a study about a specific beauty and care product?

Informed Consent in Neuromarketing Research

Informed consent has been on the public agenda since the 1970s. Essentially, the purpose of the informed consent and the associated institutional mechanism is to make sure that research subjects are aware of all implications of their participation in a research study and they are not being exploited by an abusive research institution or individual. Today, it is unconceivable to have a research project that involves human subjects, but who are not signing a consent form. In many countries, it is a requirement introduced as part of the national regulatory framework on research, but more important on medical services in general.

The main ethical issue concerning informed consent is not compliance with any regulatory framework—whether participants sign or do not sign consent forms—but the quality of the informed consent, which is the quality of the information provided to the participant and how the consent is acquired. It is one thing to inform the participant about the fact that he/she will be put into an fMRI machine and his/her brain will be scanned with the help of a strong magnetic field (with all the consequences related to (i) the fact that he/she has to remain very still throughout the scanning and claustrophobic feeling may appear, (ii) the presence of a metal inside the body of the participant, etc.) and another to explain that there might be some incidental findings regarding the status of his/her brain (cf Ulman et al. 2014), that there is a protocol in place related to the data protection and their anonymised analysis, etc. How many information should be provided to the participant is not a standard, but is based on case-to-case judgment. For example, there are many researchers that mention in their papers that the purpose of the study was not disclosed initially to their subjects because it could influence their responses (see Van der Laan et al. 2012). Is this ethically sound? Though there is no general rule concerning how many information should be provided, the researcher has the moral obligation to inform the participant about all the elements that may have an impact on his/her

physical and psychological integrity. According to the NMSBA Code of Ethics, this should include explanations related to the tools used during research (art. 5), to the protocols as well as the objectives of the study (art. 5), their possibility to withdraw (art. 5, (d)), the type of data collected and data protection rights (art. 6 and 7).

Framing the information provided to the research subject is another significant ethical concern. Saying "The fMRI technology is not invasive and it is used regularly in medical environment, with minor or no discomfort." is not the same thing as saying "There are no known cases of people being affected by fMRI technology, but there is a minimal risk of experiencing brief sessions of claustrophobia and other forms of anxiety." The way the information is presented is highly important to make participants aware of the implications and especially risks, not just about the way their data will be studied.

The informed consent may also be affected directly by the participants' level of competence. If the research study includes people with mild mental disorders, for instance, then it has to be determined if the individuals are able to understand the information provided to them or a proxy is necessary to make sure that the consent is not undermined by their condition.

Unfortunately, the general practice in neuroscience publications does not include any substantial remarks regarding the way the researchers ensured a top-quality informed consent from their subjects. The only remarks concern the fact that the informed consent was obtained, that the research was conducted according to an international or local standard (e.g., Declaration of Helsinki) and that some sort of ethical clearance was obtained from an IRB or national ethics committee. All texts from my list of reference that contain some empirical investigation are in this situation.

3.2.1.2 Ethics and Research Data Practices

This lack of information about the ethical protocols is also reflected on the way data protection practices are presented in the specialised literature. For example, there are limited or, in most cases, no information about the way confidentiality was ensured during analysis and after publication of final results. I do not contest the existence of these protocols, but not having any written remark about them, I think, leads us to a context where a general mistrust affects the validity of the research conclusions themselves. Probably, many would consider this type of remarks unnecessary due to the fact that there is an ethical clearance already mentioned and all these ethical protocols reflect a formal approach to the research and not the core of the study itself. My interest here is to show that there is much more ethical content in these "formal" constraints than anyone would expect.

Research Design and Scientific Validity

Ulman et al. (2014) connect scientific validity with the basis of validation, which is more empirical studies that verify claims made by current authors. So far, we lack this basis. In the second place, Ulman et al. (2014) point out that the use of "prepackaged"

software, especially for EEG research, with oversimplified parameters, is actually reflecting the level of competency of those using them. And this works against the scientific validity of their studies. In third place, Ulman et al. (2014) claim that the interpretative nature of neuroscientific research involves a high integration of knowledge. Sometimes, this interpretative nature works against the researcher itself because he/she might overestimate the findings and, consequently, any practical advice they offer to companies.

In my opinion, if we want to talk about good research governance or ethical research, then we need to go even further, i.e. to the research design itself. And here are at least three main ethical issues we should investigate: first and foremost, what we expect to find with the help of neuromarketing research (see Matthews 2015, pp. 1640–1641), the research hypothesis. Are we claiming that we gain some privileged knowledge that help us *predict* with more accuracy our consumer behaviour, as T. Canli (2006) hopes for, or that we at most enrich our ways of understanding—with some degree of accuracy—what drives our consumer behaviour? This question leads us back to the discussion in Sect. 3.2.1.1.1, so I will not insist.

Not just the hypothesis of the research itself is important, but also the unintended biases. For example, how relevant is the fact that the female research subjects outnumbered the male subjects or all participants were white (no Afro-American or Asian subjects included)? Are we also going to consider cultural differences in neural patterns? If there are differences in the way an American and an Eastern Asian process math problems and numbers (Tang and Tang 2016), then should we also explore if there are cultural differences in the way emotions activate the brain?

The third issue is related to the number of participants involved in neuromarketing research. Are we ready to accept that a study on 20, 50 or 150 people is *methodologically sound*? Let's see for comparison some examples, highlighting the claims of the authors (Table 3.3):

All these claims show a tendency to treat the complexity of the neural connections in a reductionist manner to prove the authors' hypotheses. But, by selecting, for instance, right-handed people, the researchers also undermine their own claims, not just the predictive model, because their "prediction" with "high accuracy" or "significant correlation" is relevant only for the right-handed people. Secondly, the low number of participants, due to whatever reasons, makes these claims sound as overclaiming. Neuro-plasticity can change totally these correlations, and, consequently, weaken the claims. The studies mentioned earlier provide no information on cases where the subject's neural activity did not correspond to the general research model; and even if the researchers encountered such *deviations*, they would have been dismissed.

Confidentiality, Anonymity and Data Security

Confidentiality in research refers to protection of the research subjects from unfair, unethical practices. In some sense, anonymity refers to the process that ensures that confidentiality is observed with maximum rigor, but also that the data is analysed in an unbiased way. Anonymisation involves the separation between the research

Table 3.3 Four examples of research cohorts and general claims (emphasise added)

Description of research participants	Study claims
Sixteen university students (8 male) with an age range between 22 and 28 years old participated in this study and were paid 15,000 KRW for their participation. All participants were right-handed and had normal or corrected-to-normal vision (Kang et al. 2015, p. 3).	In this study, we found that the formation of subjective facial preference *strongly reflected* on the EEG alpha oscillatory power. Based on these findings from the two tasks, we suggest that the spatial and temporal changes on EEG alpha power provide neural evidence of subjective facial preference and show the potential ability of EEG *to predict subjective preferences for human faces* (Kang et al. 2015, pp. 14–15).
Eighteen adult healthy human participants (14 women, age range of 18–35 years) took part in the study (Bhushan et al. 2012, p. 2).	In summary, we presented the *mind-reading* result of a complex social judgement task. Earlier mind-reading evidence was related to tasks with predominant sensory components [16, 38, 41] or based on activations of pre-selected brain regions [42–44]. Here, *we showed that it is possible to predict subjective decision* of approachability of faces *with high accuracy* based on synchronisation between multiple brain regions without any prior hypothesis. The classification process is entirely adaptive and data driven. *Our results also identified idiosyncratic and common brain responses of preference decision.* Finally, the analysed brain responses were most likely implicit and preconscious, yet we showed that they possessed significant ability to predict explicit preference decision. Altogether, *we suggest that our proposed approach* of trial-by-trial prediction (with relatively small dataset from a particular individual), together with the high range of predictability, *offers promising potential as real-world applications* such as neuromarketing, social networking and neural lie detection (Bhushan et al. 2012, p. 6).
Fifteen healthy participants (age: mean = 31.4 years, ranging from 23 to 50; 7 female) participated on the basis of written informed consent. […] All subjects had normal or corrected-to-normal vision. No subject had a history of neurological, major medical or psychiatric disorder. All participants were right-handed (Kuhn and Gallinat 2013, p. 2).	We found a *clear preference* for the same beverage when it was believed to be Coca Cola or Pepsi Cola (strong brands) compared with River Cola or T-Cola (weak brands) in self-reported pleasantness ratings. In the fMRI data we found stronger signal in mOFC parametrically modulated with pleasantness ratings during weak as compared to strong brand cues. This potentially indicates a stronger reliance on stimulus value processing when the brand cue is less informative. Furthermore *stronger activation* in the right amygdala was found for Coca Cola cues compared with Pepsi Cola cues. During the taste phase the same soft drink elicited stronger activation in left ventral striatum when it was previously announced as a strong brand compared with a weak brand. This effect was stronger in participants who drink Cola very infrequently and might point to a bigger reliance on brand cues in less experienced consumers. Taken together the present results show the strong effects of brand cues on self-reported pleasantness as well as on neural responses signalling reward in the brain (Kuhn and Gallinat 2013, p. 6).
The study included *50 participants* divided into approximately equal age groups and fairly balanced sex categories. The age ranges, i.e. 25–34, 35–44 and 45–55, involved 36 %, 34 % and 30 % of participants, respectively, whereby 48 % were men and 52 % were women (Cîrneci et al. 2014, p. 335).	Our study has found *a significant correlation* between consumption of Aldis products and cerebral activations in areas responsible for processing personal salience such as precuneus, which is part of the posterior medial part of the parietal lobe. […]
	Finding in our study *a significant correlation* between the most consumed food brand and the activations in precuneus observed with fMRI when subjects viewed the logo and package image of their preferred product is a confirmation of the involvement of this brain area in the recollection and processing of self-relevant information. Hence this brain region can be targeted in marketing studies when we want to see if a product is part of the consumers' life history. It can also be relevant when probing if a certain product designed to be seen as part of the consumer's traditions and lifestyle is fulfilling its purpose (Cîrneci et al. 2014, pp. 338–339).

findings and the data used to identify the research participants (NB: safety of *the de-anonymisation key* as key topic!). Data security, in this context, is about protecting both research findings from being used by unauthorised individuals and the de-anonymisation key from being used to breach the confidentiality protocol.

It is easy to understand why confidentiality, anonymity and data security are highly important in research, but a less evident situation that imposes some critical ethical reflection may come from the researcher-sponsor relationship. In some context, the sponsor may require all the data sets invoking all sorts of arguments (some even legal), but the researcher must be aware when he/she can hand them in. According to the NMSBA Code of Ethics, article 7, paragraph (c), the confidentiality cannot be breached in any circumstance: "participants to any neuromarketing research project shall be guaranteed that their personal data is not made available to others". The European Code of Conduct for Research Integrity, article 2.3, paragraph (2), contains a nuance that it is particularly relevant: "confidentiality of data or findings should be respected by the researcher when it is legitimately required by the client or employer".

Dual-Use Research

The dual use of research represents another important ethical issue concerning the practices in matter. The NMSBA Code of Ethics does not have any provision related to this topic. In the broad sense, "dual use" refers to the opportunity to analyse the data or findings from one research project as part of another project, for a different purpose. In this paradigm, there are no ethical issues related to dual use, maybe except the need to require a consent for the new research project as well. But this is not the meaning of the technical phrase we have in mind here. The most widely accepted and used definition of *dual-use research* was put forward by the National Research Council:

> Research that, based on current understanding, can be reasonably anticipated to provide knowledge, products, or technologies that could be directly misapplied by others to pose a threat to public health and safety, agriculture, plants, animals, the environment, or material. (National Research Council 2004)

In other words, "dual use" refers to a particular situation when research data and, consequently, the research findings obtained for a specific, positive purpose can be used in a different project to the detriment of others. For example, in biotech, some research on increasing the resistance of rice plants to environmental stress factors is misused by a third party to create a plant disease to attack crops.

In neuromarketing, the *dual-use research* is translated in situations where the findings are employed against the customer, for instance, by determining irrational consume patterns or misuse of resources. Let's suppose that one day a research team discovers by accident a neural pattern that establishes a direct connection between our compulsive food-related choices and perception of a specific modulated color; if the findings of that study would be used to influence directly the customers to buy food in excess from a particular company or in general, then that is considered dual use. Subliminal advertising, if true, would have been dual use as well.

3.2.1.3 Ethics and Publication Practices

Publication practices represent the last category of ethical concerns relative to the ethics of neuromarketing research I will refer herein. It is covering the most "visible" side of neuromarketing, i.e. the articles and books that shape trends and open markets.

Authorship Issues

First topic that needs to be addressed is the problem of authorship. The scientific literature increased so much in the last century that it is almost impossible to read all relevant articles and books on any given subject. Neuromarketing, even if it is still in its infancy, is in the same situation. Hundreds of titles are being published all over the world every year. In this vast mass of literature, sometimes it is hard to keep track of who said what. Plagiarism is the biggest threat to research integrity and it comes in many forms.

Another threat, maybe the most perverse of them all, is represented by the situation when people that are not involved in the research project are being offered a place among the authors of an article. This practice is particularly present in Europe, where a huge pressure on research publishing is manifest in the academic sector, where universities measure the performance of their professors and researchers' activity by the quantity of their publications and citations (ISI Thomson, H-index, etc.). As a general practice, the authors of a publication should also be active members of the research team and contribute consistently at the research study.

Cherry-Picking and Salami-Slicing

There are two practices in research that need special attention: "cherry-picking" and "salami-slicing". They have fancy names, but they affect so profoundly the quality of the research that should be among the most important topics in research ethics training.

Cherry-picking, as the name suggests, involves a selection process where data that contradicts or does not confirm the position of the researcher is suppressed, overlocked or disregarded as less important. It is a fallacy of selective attention: the neuromarketing researcher or neuromarketer looks at a brain area that he/she is familiar with and starts building correlations that confirm his/her hypothesis and disregards aspects that are opposed to what he/she wants to point out. It is not my goal here, but it would be interesting to analyse and see how many neuromarketing studies suffer from this *confirmation bias*.

Salami-slicing is mentioned in the European Code of Ethics for Research Integrity as one of the "publication-related lapses" that "should be taken seriously by the research community". In its understanding, salami-slicing consists in publishing research results in several smaller papers in order to gain more in publication rating rather than a bigger, more valid research paper and scoring less. So far, we do not have mechanisms to prevent this type of incorrect practice because of the way scientific performance is measured today.

Research Transparency

Transparency concerning the financial support received to conduct a neuromarketing research is essential for increasing the public trust in this field. Disclosure notices should accompany any research publication that has benefited from a sponsor. This is a general practice among scientific serial publications, but it does not cover the commercial interests of a neuromarketer who investigates with the tools and the team from its own company. There are many researchers who engage in neuromarketing research hoping to attract potential customers, and many neuromarketers who publish academic articles hoping to give a more scientific allure to their work.

Another transparency issue I want to emphasise here, one that only recently made it on the academic agenda, is the so-called replication crisis (Schooler 2014) or reproducibility crisis (Baker 2016a, b; McNutt 2014). This issue tackles one great problem with experimental work in general, which is the irreproducibility of investigation done by one laboratory by an independent researcher or research centre. This problem is generated on one hand by the quality of the research work, especially when we deal with cherry-picking practices, and, on the other hand, lack of transparent reporting of data processing. Consequently, an ethical attitude in scientific research, including neuromarketing research, is to provide open access to research data. As someone wrote once, science works by corroboration.

3.2.2 Ethics of the Use of Brain Imaging Technologies in Neuromarketing

3.2.2.1 The Use of Brain Imaging Technologies

During the initial phases of a neuromarketing research, when the consent is obtained, the neuromarketer has to inform the patient also about the risks associated with the specific technologies involved in the study. For example, common practice in research protocols is to describe the technology and the potential hazards and risks, to acquire information that might exclude the subject from the study (e.g. in MR scanning, people with metal implants cannot participate because they are at risk from the electromagnetic coil) and to report on limitations regarding data usage and liability.

The biometric technologies used in neuromarketing studies come with considerable lower risks than the neuroimaging technologies. A special pair of plastic glasses that observes the eye movements during a simulated or real shopping experience will not impose a significant risk, especially if compared with an fMRI, where the research subject is introduced in a device that uses electromagnetic waves to measure the level of blood oxygenation in the brain, a machine that does an incredible sound and make people feel claustrophobic.

When the neuromarketer works with human subjects, he has the legal and moral obligation that his work does not harm them. The formal consent may seem as a mere legal compliance requirement, something that is asked by the law and Institutional Review Boards/Ethics Councils, but it is much more than that: as I was mentioning in Sects. 3.2.1.1.2 and 3.2.1.1.3, it stands on the solid ground of the moral principles, i.e. the principle of respect for persons (human dignity) and the beneficence principle (with its corollary—the non-maleficence principle).

This moral obligation does not cover only obvious situations like the exclusion of people with metal implants from the research cohort, but also cases where the neuromarketer observes symptoms that may lead to any kind of harm. The most obvious example would be represented by people who experience some medical conditions which can involve seizures during scanning, panic attacks within the neuroimaging machine, etc. But there are also cases where the presumed healthy research participant needs some sort of assistance: some neuro-studies involve patients with mental illnesses. The researcher needs to assess very well the status of the participant before proceeding with the neuroimaging session.

The NMSBA Code of Ethics covers this ethical duty in the Article 2: "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" (see Addenda A.1). In many countries, there is specific legislation concerning this ethical obligation in clinical and non-clinical studies (e.g. US—Federal Policy for the Protection of Human Subjects; cf. WMA Declaration of Helsinki—Ethical Principles for Medical Research Involving Human Subjects).

3.2.2.2 Privacy

The concept of privacy is a modern invention by far. Its first developments may be traced back to the nineteenth century, when some of the new technologies introduced during the Industrial Revolution changed the way people interacted. For instance, the extending railway networks brought people closer not just in terms of physical distance, but also in terms of communication and acquaintance: a bunch of strangers were sitting in the same wagon for a couple of hours or days and this reduced drastically the personal sphere everyone enjoyed in his/her own carriage. In nineteenth-century Britain, the intrusion in personal sphere became the subject matter of one of the most played comedies of the moment, "Paul Pry" by John Poole (Vincent 2015). Talking about the context of this play, Vincent makes use of a distinction between "privacy from" and "privacy for". The first concept introduces the need for control over the invasion by others in our lives, but without eliminating the idea that the individual is a social being: he exercises a balanced control over how much others know about him, without excluding himself from the social sphere. The second concept, "privacy for", represents "the capacity to police the access of outsiders and thus create a zone in which personal information is shared only between individuals linked by mutual trust, care, and respect" (Vincent 2015, p. 30). In other words, individuals should enjoy privacy *away from any intrusion* and *for their own social benefit*.

The current concept of privacy emphasises more this reference to the individual to the detriment of a spatial representation: it is about people, not places (homes, private spaces, etc.). The individual is protected from any kind of intrusion in what represents the most intimate aspects of his/her life, no matter where he/she is, if he/she sits in his/her living room or in a medical facility where a big machine is scanning his/her brain. So, when we talk about privacy in neuromarketing research and applications, we need to bear in mind that it is not about where the individual is located, but about his/her control over his/her own individuality, about the information that make up this individuality. We call this control *autonomy*, the capacity of the individual to decide how much information shares about himself/herself and when. When this autonomy gets regulated or it is affected by external elements, the individual feels that his/her privacy has been diminished.

Some people have inferred that privacy is no longer an issue today for the new generations (e.g. millennials) because of the way these individuals interact in online environment.[8] In other words, these so-called digital natives are weakening, if not destroying, the concept of privacy because of their online behaviour. Although this hypothesis still needs to be confirmed by methodologically sound research, there is definitely a constant challenge regarding the sacrosanct aspect of privacy coming from the same technological development. The new communication technologies (e.g. social media, cloud technologies), for example, have a deep impact not only on our online interactions, but also on medical research and medical services. At a conference a few years back, I was arguing that cloud solutions used in the medical environment (in hospitals and their extensions) come with a lot of ethical implications, some related to privacy. For example, if the patient's file contains information related to genetic profile, this can be illegally harvested from the system for specific screenings regarding predisposition to a certain disease. Now imagine an insurance company gaining access to this genetic profile and refusing to issue an insurance policy because the individual has a certain genetic marker, which is regularly associated with a mortal disease.

Going back to neuromarketing technologies, like in the case of genetics (Korn 2001, p. 106; Farah 2005, p. 35), they spur public anxiety because they are seen as "intrusive" (Arlauskaité and Sferle 2013; Ulman et al. 2014; Ariely and Berns 2010), hacking the very idea of *autonomy*. Inspecting what happens in our skulls, these technologies go beyond any explicit or implicit consent over what and when we share with others. Moreover, these technologies are seen as an open door for "abusive" practices.

It is easy to understand why neuromarketing is perceived as a profound challenge for privacy, especially by those who do not really understand how neuroimaging and biometric technologies work. "The promise to read our thoughts, or at least to read some of them" (Edwards 2012, p. 245), or to uncover the most intimate desires and emotions, it can make anyone feel some anxiety, if not fear, that (1) someone gained access to the most intimate thoughts that never get to be verbalised or (2) that his/her decisions are captured by unethical practices.

[8] For further details, see the survey conducted by USC Annenberg Center for the Digital Future and Bovitz Inc. on online privacy among millennials: http://annenberg.usc.edu/news/around-usc-annenberg/online-privacy-over-findings-usc-annenberg-center-digital-future-show.

But the entire discussion about privacy and neuromarketing is not as simple as we would like. First of all, we need to distinguish between privacy applied to social behaviour, and I will call this *social privacy*, and privacy applied to human brain, *neural privacy*. When Vincent (2015) was discussing about this concept, he was approaching it as a matter of social behaviour: intrusions in the private sphere were related to what people do, what they say or how they are. The last type it involves a privileged access to human brain activity, via neuroimaging or biometric technologies. This is what the neuromarketing research aims or promises to deliver: if we look at the way our brains work, we will know that people will be more inclined to buy a product because it is associated with an emotional trigger, for instance. Is this privileged access to our brains' bioelectrochemical reactions really a matter of "reading"? As we saw previously, if we take into consideration the present status of the technologies used in neuromarketing research, it is a huge overclaim. And if we cannot *read* the mind, then why should we bother with privacy in neurosciences, in general, not just neuromarketing?

First and foremost, the neural privacy refers to the way we understand the use of these "intrusive" technologies *for research purposes*. But this is a subject that falls within the boundaries of research ethics, not neuromarketing ethics per se. Neuromarketing studies involve data gathering through a myriad of technologies and research practices, where the data provide an imagination of the human brain activity. This data is gathered from a specific pool of research participants and processed using a statistical methodology. For this, as I have shown in Sect. 3.2.1.1.1, the participants need to consent based on the information they receive from researchers. In order to use this data in a statistical manner, the researchers have to anonymise the information. The consent carries the trust the research participant credits with the researcher that his/her personal data will not be used in a way that will lead to his/her identification. For this particular reason, according to the best practices in research data security, the researcher should store the data in a secure place, while the de-anonymisation key should be encrypted on a different electronic support (see also the ESF Code of Conduct for Research Integrity 2.3).

Accepting that the researcher takes all the necessary measures to ensure the anonymity of the participants' data, should we also accept that the mere neuroimaging or biometric data poses a challenge to privacy? If we look at an fMRI map of brain activity, we really do not know anything particular about the social behaviour of the participant or his/her thoughts. The black, blue, red, yellow or red areas showing up on the fMRI computer do not tell us anything about "what is inside the participants' mind" (Logothetis 2008). What really makes us think twice about privacy is the interpretation given by the researcher to this map. If the map can tell us more than the mere fact that the brain is active, which is not so uncommon if we think about living beings that hold a brain, all this information is part of the realm of privacy. For example, if the neuromarketing researcher was expecting to see that a certain brain region should have activated by certain stimuli, like in the majority of research participants, and he/she discovers that this negative result is influenced by a neural abnormality, then this "incidental finding" should be excluded from the research analysis. Moreover, there is an ethical issue related to the consent and what should happen with this type of incidental findings. But I will discuss this in the next Sect. 3.2.2.3.

Moreover, the neuromarketing research poses another privacy problem, this time a problem of identity. If the neuroimaging and biometric technologies used by neuromarketers give an account of our most intimate reactions to external stimuli, our brain activity, then this presupposes that this knowledge overrides any censorship mechanism: we are not just emotions and desires, irrational impulses, we are also conscious thoughts, rational decisions and explicit value-based behaviour. It would be impossible to say in what percentage we are rational beings and/or irrational actors, but definitely there are times when an individual controls his/her desires and emotions or acts against them. Have you ever tried to refrain from buying a product you desired very much?

This logic of focusing on the irrational, unconscious behaviour that neuromarketing is practicing creates a tension between our identity and the privacy we should enjoy: Even if our identity is made of this mere irrational, unconscious behaviour, why should this be known to anyone? (Fuchs 2006, p. 601) Or be used by anyone? This latter situation leads us to the idea of privacy in the use of neuroimaging and biometric technologies *for applied purposes*. If this privileged knowledge regarding our identity is used to design more appealing products or more attractive shopping experiences, to advertise more effectively, etc., then are we in a context where our autonomy as customer is affected? Is this an unprecedented cease of control over our own brain and behaviour for the sake of better marketing techniques? Are these applications actually tricking our censorship mechanism to make use of the most intimate brain reactions?

For Matthews (2015), the privacy issue is directly related to the "potential for harm": "what (special) harm may come when neuromarketers obtain my brain information in the non-consenting case?" (p. 1642). And he goes on presenting a hypothetical situation where a neuromarketer has the ability to interpret the brain activity and determine with a relative accuracy our own emotions and loyalties to the brands in a specific purchase setup. Based on this particular context, with the help of an analogy with the situation where a sales agent tries to convince us to buy a product, he/she concludes that a brain scanning does not involve a violation of privacy because the information it provides does not harm us. As he puts it: "it is not as though the scanner can read my mind and find out my address" (p. 1643). Matthews distinguishes between *perceptual privacy*, which is actually a case of voyeurism—some looks over the window of a house to see what the landlords do in their spare time—and *self-presentation privacy*. For him, neuromarketing falls in this second type, because the information about who we are in terms of emotions and loyalties to the brands is not different than the way we present them during a marketing research with the traditional tools. We should also worry that the salesperson gained private information about our desires and thoughts.

Pace Matthews (2015) and Ariely and Berns (2010) consider the "individuals need to be able to exercise control over what they choose to reveal about their personal preferences" (p. 9). According to them, the breach of privacy would occur only "if neuroimaging revealed a private preference that is outside the scope of the neuromarketer's research questions" (Ariely and Berns 2010, *infra*). As we have seen above, the fact that the neuromarketer gains knowledge of "uncensorship" brain reactions may involve a tension in subject's privacy.

3.2.2.3 Incidental Findings

The issue of incidental findings is not necessarily one of the most puzzling ethical concerns related to the use of brain scanning technologies, but it is definitely one of those that require a more profound approach: primarily, because any abnormality, discovered or not discovered, in the brain of a participant may have a significant impact on the research design and the individual himself/herself (Katzman et al. 1999; Illes 2004a, b; Grossman and Bernat 2004; Presidential Commission for the Study of Bioethical Issues 2013), and secondarily, because their presence might lead to a radical change in the statute of the research participant, who becomes "a patient", and, depending on the findings' severity, involve specific clinical protocols.

First of all, what are these incidental findings? Essentially, they represent an unanticipated information about an abnormal condition of the brain discovered during a neuroimaging session but being outside the original purpose for which the session was conducted. In other words, the researchers look at the screen of a computer and the image provided by the neuroimaging technology they use says that there is either a deficiency in the way a brain region activates (in the neural processes) or a sort of brain lesion associated with an unknown medical condition (e.g. infections, arteriovenous malformations, infarction, tumors).

It is worth noting that these deficiencies would have remained unknown to the research participant if he/she didn't take part in the study. They cannot be revealed using biometric technologies, but only neuroimaging tools like MRI and fMRI. EEG, MEG, PET and SPECT can also provide this type of unanticipated discoveries, but MRI and fMRI are prevalent in both clinical and non-clinical studies.[9]

Katzman et al. (1999) propose a classification of the incidental findings using a method he borrowed from the Cardiovascular Health Study conducted by the National Heart, Lung, and Blood Institute (US). His classification has four levels:

1. "No referral necessary"—there are no relevant findings or they are common to asymptomatic subjects.
2. "Routine referral"—this type involves findings which need further investigations, but do not require medical intervention on the spot or later on.
3. "Urgent referral"—the incidental findings included in this category require medical evaluation within weeks from the moment of their discovery.
4. "Immediate referral"—this is the most problematic category because these findings require immediate clinical intervention.

Katzman et al. (1999) include in the first category infections like sinusitis, in the second—old infarction, in the third—tumors that need observation, but not invasive measures (e.g. low-grade astrocytoma), and in the fourth—brain lesions which need immediate clinical reaction (e.g. acute subdural hematoma).

[9] Illes et al. (2002) were mentioning that when she and her colleagues were writing their paper there was no "systematic analysis of incidental findings in research EEG, MEG, PET, or SPECT". Meanwhile, this hasn't changed. I didn't manage to find any study approaching incidental findings in brain imaging, though there are studies related to incidental findings in the use of PET and SPECT on other areas of the human body (e.g. lungs for lung cancer studies).

According to all consulted analyses, the rate of incidental findings is low. For example, Katzman et al. (1999) surveyed a cohort of 1000 healthy volunteers scanned with an MRI during various studies; only 18 % of the total scans contained incidental findings (15.1 %—"no referral", 1.8 %—"routine referral", 1.1 %—"urgent referral" and none that required "immediate referral"). Illes et al. (2004a), using the same classification, but on a much smaller number of scans, i.e. 151, determined that only 71 of them (accounting for 47 %) contained incidental findings. Out of these 71, only 10 required clinical follow-up. Two years earlier, Illes et al. (2002) used a larger number of fMRI scans, i.e. 225, of children (newborns to 17 years) who were "presumed to be neurologically healthy" (p. 360). Only the scans of 47 children contained incidental findings, and only 17/47 required "routine referral". Still, they also found one single case of incidental findings that was considered urgent.

These statistics are important, but they tell us nothing about the type of incidental findings discovered on a second analysis of the MR scans. Katzman et al.'s (1999) analysis reveals that the category 3 findings included "2 confirmed and 1 unconfirmed primary central nervous system tumors" (p. 37). The pediatric case from Illes et al. (2002) was a cerebellar lesion, while those from 2004 included "bilateral mastoid disease, mild chronic small vessel ischemic disease, mild pontine and supratentorial chronic small vessel disease", categorised as requiring "routine referral", and "a cavernous angioma and arteriovenous malformations in the posterior right temporal lobe and anterior of the right frontal lobe" as requiring "urgent referral" (Illes et al. 2004a, p. 889). All these are significant brain problems, but they were not uncovered during the initial studies. This is why many of the authors cited here ask for a "routine involvement of trained radiologists" in non-clinical studies, "for both detection and as well as appropriate follow-up" (Illes et al. 2002, p. 360). It is also what the Presidential Commission for the Study of Bioethical Issues (2013) recommends.

All the cases reviewed by Katzman et al. (1999) and Illes et al. (2002, 2004a, b) were not reported to the research participants during the original study. In fact, as was mentioned earlier, they went unobserved. Let's assume now that we are dealing with a neuromarketing study using fMRI and that out of the 32 research participants 5 presented incidental findings, no matter if they are classified as second, third or fourth category. All 32 participants were presumed healthy by the neuromarketing researchers and the incidental findings were missed by them. Is such a research still trustworthy giving the fact that the interpretation of the brain activity in 5 of the 32 subjects was also influenced by the presence of an asymptomatic abnormality? Most probably, the answer to this question depends on the bioelectrochemical connection between the abnormality and the brain regions under scrutiny. But if the original researcher didn't see the abnormality, is this connection still relevant?

Grossman and Bernat (2004) consider that the ethical issue lies in the consideration researchers owe to their subjects to discover abnormalities if they are present: "the subject trusts that the research team will observe it" (p. 849). For this particular reason, their recommendation is to include in the research team a person who has the skills at neuroimaging. But this is already the case in most neuromarketing research teams that use fMRI—probably, due to the complexity of the technology and to the way it provides information about brain activity—and not necessarily when we look

at those who use EEG and/or biometric technologies. In this situation, maybe the recommendation should be to check the scans not only for the original purpose of the study, but also for any kind of abnormality that would undermine the scientific interpretation; and this process requires quite frankly a neurologist.

Why is this important, beyond the obvious idea of research quality? There are at least two reasons. The crucial one is the fact that these research subjects are going through a complex scanning of their brains and it would be in their best interest if this procedure would serve not only for the purpose of the study, but also for their health condition. But is there a moral obligation of researchers to discover anything that would hurt the patient, even if they look for something else? This is at least the opinion of Grossman and Bernat (2004), and it would be like looking for the needle in the haystack; it will cost a lot of money and time (they agree with this, but they think that it is irrelevant when you compare with the costs of not discovering the abnormalities); it also may induce an anxiety in the subjects knowing that the research will also focus on abnormalities in their brains. The balance is brought by the Presidential Commission for the Study of Bioethical Issues (2013), who asks for more awareness about incidental findings among clinicians and researchers, research participants and other stakeholders, not for comprehensive evaluations of the brain scans.

The second reason is that any abnormality may actually influence the interpretation of the raw data in brain neuroimaging. If you are looking for brain activity in the amygdala and close to it you find a very small tumor, can anybody determine how this can affect the function of amygdala? Someone may reply that statistical observations may eliminate any doubts, but when the number of research participants is as low as 20 individuals, how can you extrapolate with any given validity for a larger population? *Statistically*, these types of interpretations are way unbalanced because the input, i.e. the brain activity, is presumed to be that of a healthy person, but is actually of a person with a brain lesion. Only a neurologist would be able to make the difference in the brain activity and brain condition, especially when such an abnormality is asymptomatic.

Let's consider that the abnormalities were discovered during the original study. The NMSBA Code of Ethics says that neuromarketing researchers should have in place a protocol dealing with incidental findings (Article 3, see Addenda A.1; cf. Illes et al. 2004a; Grossman and Bernat 2004). What kind of topics should this protocol cover? First of all, "who should receive the results and in what setting should be discussed" (Grossman and Bernat 2004). In this particular context, the individual is no longer a research participant, but a patient. If the information about the abnormality is transmitted to a caregiver instead of or besides the participant/patient, then there is a breach of confidence between researcher and participant/patient. Grossman and Bernat 2004 consider that only an IRB should deal with such a dilemma. There are people who argue that the participant/patient has the autonomy to decide if he wants to disclose the information to a caregiver and receive treatment or, on the contrary, don't do anything, including refusal to disclose. Illes et al. (2004a) talk about the case of Stanford University which updated its non-clinical benefit clause from the consent form "to include a request for primary physician contact information and a statement that any follow-up treatment decision lies solely with the subject and physician" (p. 889).

No matter what position we adopt in this *political/institutional* balancing, incidental findings pose significant ethical challenges and need careful consideration not only from neuroscientists in general, but also from those involved in neuromarketing.

3.2.3 Ethics of Neuromarketing Applications

Most neuromarketing research has a very practical goal: to inform effective marketing strategies and advertisement campaigns. A company specialised in this type of research will always be interested in monetising the special knowledge it has about brain activity and the technologies it owns. This is the business side of neuromarketing, where research goes into applications. From this perspective, there are plenty of topics that cover the ethical aspects of business-to-business activity, but these are less interesting than those introduced by the marketing and advertising practices based on neuromarketing insights. Following the general claims of neuromarketers themselves and of their opponents, the following subsections are dedicated to two of these practices that present special ethical challenges.

3.2.3.1 Manipulative Marketing Practices

The first topic is related to the idea that neuromarketing and neuromarketers discover and make use of special "doors" to our most intimate parts of our lives: our desires and emotions, our thoughts and intuitions, our loyalties and dislikes. This is why there is a general public opinion that accuses neuromarketing of being "manipulative": it exploits our internal mental traits to make us buy things we don't really need, to use services otherwise irrelevant or unnecessary, to choose one thing over another. This widespread fear is based on many myths and urban legends that accompany this field. For example, James Vicary is credited for introducing the idea of "subliminal advertising", the so-called hidden persuasion, but he failed to prove it to exist; and all recent scientific studies have shown the contrary. Moreover, with the help of Vance Packard's book *The Hidden Persuaders* and other public commentators, in February 1958, the US Congress voted in on a bill to ban subliminal advertising on TV (Kiesel 1984, p. 26). Another myth I have already discussed is represented by the "buy button" concept.

The ethical problem with the idea that neuromarketing is manipulative is that it suspends or overrides the customer's autonomy. Murphy et al. (2008) mention this consumer autonomy as one of the two most substantial ethical issues in neuromarketing. Murphy and his colleagues do not use the words "subliminal" or "hidden" to classify the neuromarketing applications, but they prefer the phrase "stealth marketing": by "providing sufficient insight into human neural function", a marketer will be able to "manipulate the brain such that the consumer *cannot* detect the subterfuge and that such manipulations result in the desired behavior in at least some exposed persons" (Murphy et al. 2008, p. 297).

Autonomy is a highly priced moral concept since Kant and both the US and European bioethics traditions place it right in the core of the fundamental ethical principles. *Grosso modo*, in our context, consumer autonomy refers to the capacity of the individual to make his/her own buying decisions, without external (hidden) influence.

Let's say that a medical association discovers a strong correlation in the alcohol abuse in South Dakota and the high number of car accidents. Would it be unethical to create an advertising campaign that makes use of neuromarketing insights in order to reduce the level of alcohol consumption? The goal of the advertising campaign is without any doubt a good one, but is it all that counts in a moral evaluation? In this case, we commonly say that "the end justifies the means". But this doesn't pass the ethical test because the campaign itself would involve pervasive techniques that eliminate any level of consumer autonomy. It would be interpreted by some as a paternalistic method of dealing with a social problem by addressing individual behaviour.

I think the best situation that describes the ethical tension in this neuromarketing applications vs. consumer autonomy dispute is the one where the marketing practices are directed to voters. Even if we would demonstrate that they are efficient for making voters prefer the best political candidate, still it can be argued that this will affect the autonomy of the individual to develop his/her own, untainted, preferences and dislikes. It will also introduce an unfair competition among the candidates: one will be able to change the mind of voters via neuro-informed stage performances, and not as a result of a balanced decision over political platforms and programs.

The NMBSA Code, though called "The Code of Ethics for the *Application of Neuroscience in Business*", does not talk at all about these two issues: the autonomy of the consumer and the fair competition. Its focus is on the neuromarketing research, not on the applications in business.

3.2.3.2 Exacerbating the Emotional Factor

Today, most marketing and advertising practices are excessively targeting the emotional factor because practitioners claim that there is a direct correlation between this type of focus and the figures in sales. From social campaigns (e.g. Avon building a marketing campaign in support of a social cause like breast cancer prevention) to advertisement for beauty and care, Web services, textile, food or even toys industries (e.g. sexual arousal in Axe, Go Daddy or Sisley ads), all highlight a specific type of emotion. Are these practices ethically sound? Probably, an advertiser would say that there is nothing wrong in making an ad that presents a teen in a swim suit from behind next to a text that reads "It fits.", or a naked girl with a hat that has two extensions that cover her breasts and says "nothing to add", as long as there is no full nudity involved and the campaign reaches its goal. Would we call this responsible advertising? (Illustration 3.1).

But this is not really what I am interested in here. What I want to discuss is the fact that all neuromarketing studies I have consulted discuss extensively about the emotional response in the human brain (insula, amygdala, limbic system in general, etc.)

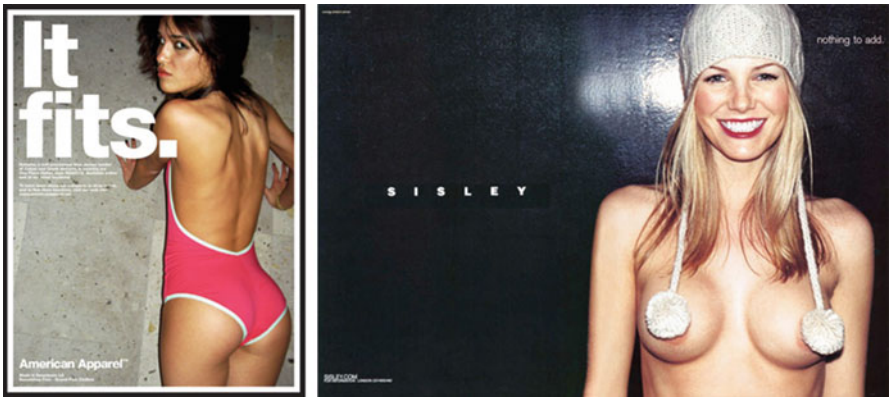

Illustration 3.1 *Left*: American Apparel poster. *Right*: Sisley poster

and emphasise its relevance for "trapping" the consumer's choice. In other words, by focusing excessively on this emotional factor, the practices they inform are similar and can be regarded as ethically questionable.

One distinction that can throw some light on this topic can be found in Ariely and Berns (2010). They use a distinction between central and peripheral routes of influence. "A central route aims to influence consumers' preferences about the functional aspects of the product (for example, fewer calories in a beer). A peripheral route attempts to manipulate preferences through things that are peripherally related to the product (for example, sex appeal of people in advertisements)". Should we regard the peripheral route as an illicit way of influencing people? It definitely draws attention from what really matters to something that stirs the individual's neural connections, but not all examples are like the one used by Ariely and Berns (2010). For example, in an ad for Aldi ham, the focus might be on coziness and not on sex appeal, though the same brain region may be involved in codifying both emotions: familiar pleasantness and sexual pleasure.

The ethical challenge lies in the way a neuromarketer informs the business practices, and this reflects also on the research design. There is also a difference if the neuromarketer is conducting the research before the product is launched (including product design and market experience) or after. For instance, if the neuromarketer's focus will be on emotions triggered in the participant's brain during product selection, then what he/she delivers to his/her client is exactly an interpretation of this brain activity that links emotions to the product. In order to make the product more attractive and increase the sales, the client might emphasise even more the emotional factor and, consequently, lead to a series of overinflated marketing practices like the ones I mentioned before, where the human body—the object of lust—becomes an instrument for higher sales.

In this "emotional economy", where the peripheral overcomes the central route of influence, we might lose things like "rational consumer", "sustainable consumption" and "sustainable production". This overinflated practices, actually, keep the consumer captive to the company's need to sell more,

instead of serving his/her interest, providing according to his/her needs. And a moral blindness covers the entire spectrum of marketing practices for the benefit of the business, for the sake of profit.

3.3 Conclusions

Neuromarketing is, of course, a new, emerging field, going through significant changes as part of its evolution. But this evolution should include a more qualified debate on the ethical challenges posed both by research and applied parts. It is also necessary to discern better between what neuromarketing can deliver today and its folk representations, with a stronger emphasis on rebuking those claims that serve the business interest of some researchers but affect the perception on the field in general and the researchers and practitioners' community in particular.

If the research ethics of neuromarketing can build on the main developments of research ethics, especially from the biomedical research, there is a growing need to develop (1) an ethics of the technologies involved in the neuromarketing research, and (2) a business ethics that takes into consideration the applications of neuromarketing research. These last two elements still need to make it into the codes of ethics of the relevant professional associations (NMSBA, ESOMAR, etc.).

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Chapter 4
A Guideline for Ethical Aspects in Conducting Neuromarketing Studies

David Hensel, Lisa-Charlotte Wolter, and Judith Znanewitz

4.1 Introduction

The potential of neuromarketing to get a holistic picture of consumers and their subconscious responses to marketing stimuli has been fascinating marketing practitioners and researchers for several decades. Microsoft, Yahoo, Hyundai, or PayPal are examples of global companies that have been inspired by neuromarketing research projects (Burkitt 2009). Besides the promising advantages, marketing managers have to deal with several challenges when they plan and conduct a neuromarketing study. A central challenge is to act ethically with regard to using neuroscientific technologies for marketing research. "Neuromarketing both has its promises and uses, but also its perils and problems. To get to a valid use of neuroscience in marketing and consumer insights, we need to face these challenges and accommodate the practices accordingly. While academic researchers are (or should be) well versed in ethics codes of conduct, this is often not the case for commercial uses of neuroscience" (Ramsøy 2014, p. 498). In some cases, the output of such studies can even be helpful for societal questions, too. For example, researchers from the Center for Economics and Neuroscience (CENs) at Bonn University adapted brain-scan technology in a research project to investigate the behavior of consumers of fair-trade products (WiWo 2015).

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D. Hensel • J. Znanewitz
Helmut Schmidt University, Hamburg, Germany
e-mail: hensel@hsu-hh.de; znanewitz@hsu-hh.de

L.-C. Wolter (✉)
Hamburg Media School, Hamburg, Germany
e-mail: l.wolter@hamburgmediaschool.com

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But in a majority of cases the aims are intrinsically commercial, and that is when serious concerns arise regarding an unethical utilization of the knowledge in the field.

Different institutions like the Dana Foundation, an organization that supports brain research, already discussed the need for consumer protection several years ago and cite Murphy, Illes, and Reiner's recommendations for the industry to adopt the Neuromarketing Code of Ethics developed by Murphy et al. (Parson 2011; Murphy et al. 2008), an ethical framework within which to conduct neuromarketing studies.

Continuous technological development in the hard- and software of neuroscientific measurement tools leads to various means of implementing marketing research approaches. As a result, managers find it increasingly challenging to decide what is ethically correct in neuromarketing and what is not. Ramsøy (2014) states: "But as with most technologies, it is not the technology but the use of it that can challenge ethical uses" (p. 498). Most of the existing neuroethical guidelines deliver general codes. Furthermore, they are limited in their tool-specific perspective and often do not provide marketing practitioners with definitive answers.

The aim of this chapter is to develop a comprehensive framework of ethical guidelines that considers the particular characteristics of different neuroscientific techniques. Grounded in Roskies's (2005) considerations of the ethics of neuroscience, we extend the Neuromarketing Science & Business Association (NMSBA) Code of Ethics (2013) by integrating the Neuromarketing Code of Ethics that Murphy et al. (2008) propose. The study aims to promote the discourse on the ethics of neuromarketing and to support managers in acting correctly with respect to ethical questions in neuromarketing projects.

The chapter is structured as follows. First, we provide the conceptual background of the study. Based on a distinction between basic consumer neuroscience and applied neuromarketing, we distinguish between the ethics of neuroscience in marketing research and in practice. In the subsequent steps we develop a comprehensive framework of ethical guidelines. The chapter concludes with a discussion of and an outlook on future research in the field of neuromarketing ethics.

4.2 Conceptual Background

4.2.1 Neuromarketing

Neuromarketing is an interdisciplinary field that is based on neuroeconomics, neuroscience, and marketing research (Ulman et al. 2015). It is an expansion of neuroeconomics (Pop et al. 2014) that emerged from neuroscience in the late 1990s (van Schaik 2013). According to Morin (2011), one of the first empirical studies in neuromarketing was the "Pepsi Challenge"[1] in 2003. The publication of this study in 2004 focused global attention on neuromarketing (Olteanu 2015). Until then, there

[1] In this experiment, a group of people drank Pepsi or Coke while their brains were scanned through functional magnetic resonance imaging (fMRI) (Olteanu 2015). The study was named "Cola Brains" (McClure et al. 2004; Pispers and Dabrowski 2011; Pop and Iorga 2012).

had been little understanding of how consumers are influenced by emotion-driven, unconscious responses to products (Voorhees et al. 2013). From then on, the application of neuroscience research to marketing and advertising strategy has increased rapidly. This growing interest is due to the expectation that neuromarketing offers a more profound understanding of the relationship between marketing stimuli and consumer preferences (Kenning and Plassmann 2008; Voorhees et al. 2013).

There are various definitions of neuromarketing in the literature, and they have been discussed at length over the past few years (van Schaik 2013). Some emphasize the aim of neuromarketing by describing it as the use of neuroscience to gain "powerful insights into the human brain's responses to marketing stimuli" (Murphy et al. 2008, p. 293) in order to "try to determine a person's unconscious biological reactions to a product" (Parson 2011, p. 1) without relying on subjective self-reports. Other definitions stress the technical-methodological aspect by defining neuromarketing as the "application of neuroimaging methods to product marketing" (Ariely and Berns 2010, p. 284) or "the use of brain imaging to measure consumers' desire for a product" (Macdonald 2011, p. 1273).

In its broadest sense, neuromarketing constitutes a "discipline that employs advanced technology in order to find a better way to satisfy the consumer" (Touhami et al. 2011, p. 1531). According to Lee et al. (2007), neuromarketing is a "valid field of study" and is more than "the application of neuroimaging techniques to sell products" (Lee et al. 2007, p. 200).

Neuromarketing can be distinguished from consumer neuroscience (van Schaik 2013). However, some authors seem to treat the terms neuromarketing and consumer neuroscience as synonyms. While consumer neuroscience explicitly refers to a scientific approach, neuromarketing is the "application of the findings from consumer neuroscience within the scope of managerial practice" (Hubert and Kenning 2008, p. 274). In line with this distinction, consumer neuroscience and neuromarketing rely on the same methods but are committed to different objectives: The former focuses on basic research, while the latter is concerned with practical applications.

An ethical debate over the past few years has focused especially on the commercial aspects of neuromarketing. Missing transparency in neuromarketing studies and consumer manipulation are some of the main concerns of unethical behavior in conducting market research with neuroscientific tools. Most companies using neuromarketing research tools usually disclose their methodology, but these descriptions are not always sufficient to determine what is actually being done (Fisher et al. 2010). Another central ethical problem in neuromarketing is the loss of consumer autonomy (Murphy et al. 2008). Since technological innovations in science expand the understanding of brain processes (Loiacono 2009), methods of neuroscience can be used to manipulate consumers in unethical ways. For example, in 2011, the Federal Trade Commission received a complaint against Frito-Lay by a consortium of consumer-protection groups alleging that the company had used "neuromarketing 'designed to trigger subconscious, emotional arousal' in order to promote high-fat snack food to teens" (Satel and Lilienfeld 2013).

Inter alia because of the reasons mentioned above, both practitioners and academics have called for the development of a clear regulatory framework in neuromarketing (Briesemeister 2015; Ulman et al. 2015).

Despite the need for ethical guidelines and in contrast to medical application of neuroscientific methods, where many technologies originate (e.g., fMRI), no comprehensive ethical framework has been developed for consumer neuroscience and neuromarketing so far. It is indeed highly questionable whether and to what extent ethical standards of medicine can be transferred to neuromarketing, since they follow different objectives, i.e., a patient's health versus a consumer's buying decision. For example, if a PET scan is used to diagnose a patient's illness, the health risk of exposure to radiation may be negligible, whereas its use for developing an optimized advertisement may be considered too risky.

The interdisciplinary character of neuromarketing has to take into account the ethical standards of all included disciplines like psychology or marketing research (e.g., ESOMAR/ICC). The NMSBA has incorporated the principles of the ESOMAR/ICC code into its Code of Ethics for the application of neuroscience in business, which it adopted in 2013 (NMSBA 2013). It is the most recent framework containing a series of ethical aspects (Sebastian 2014). However, a differentiated consideration of the various neuromarketing tools has not been included as yet. Moreover, it is not clear which recent conceptual advances in the ethics of neuromarketing have been integrated.

4.2.2 The Ethics of Neuroscience and Neuromarketing

Ethical problems in brain research have led to a new field of study called neuroethics (Fuchs 2006). At a conference in 2002, William Safire was among the first to use the term neuroethics (Sebastian 2014). Illes and Bird (2006) suggest that neuroethics is a field concerned with aspects of neuroscience research itself and with the legal, ethical, and social policy implications of neuroscience. Gazzaniga (2006) defines neuroethics as the verification of how we want to deal with the social issues of mortality, disease, lifestyle, and living philosophy because of a better understanding of the underlying brain mechanisms.

Roskies (2002) distinguishes between the neuroscience of ethics and the ethics of neuroscience. The former is "a scientific approach to understand ethical behavior" (Roskies 2005, p. 18), whereas the ethics of neuroscience is concerned both with the ethics of practice that "guide our practices of brain research and treatment of neurological disease" and with the ethical implications of neuroscience that help to explore "the effects that advances in our understanding of brain function have on our social, moral, and philosophical views" (Roskies 2005, p. 18). This duality between the practices of research, i.e., the methods and tools applied when studying cognitive processes of individuals, and its implications, i.e., the impact on social reality when findings and methods are disseminated to social practices, mirrors the interplay between basic consumer neuroscience and applied neuromarketing. This distinction and Murhy et al.'s subsequent Neuromarketing Code of Ethics (Murphy et al. 2008) form a basis for the discussion in the following section.

Murphy et al. (2008) use a similar distinction as Roskies in consumer neuroscience and neuromarketing and divide ethical issues into two major categories: (1) protection of various parties who may be harmed or exploited by the research, marketing, and deployment of neuromarketing (consumer neuroscience) and (2) protection of consumer autonomy if neuromarketing reaches a critical level of effectiveness (neuromarketing). Furthermore, Murphy et al. (2008) divide the two major categories into five perspectives: (1) protection of research subjects; (2) protection of vulnerable populations from marketing exploitation; (3) full disclosure of goals, risks, and benefits; (4) accurate media and marketing representation; and (5) internal and external scientific validity (Murphy et al. 2008). In accordance with the goals of the Code of Ethics advanced by Murphy et al. (2008), which promotes both research and development and commercial application alongside an ethically correct use of neuroimaging technology at all stages of development, deployment, and dissemination, we use this final distinction to develop the comprehensive framework presented in Sect. 4.3.

Studies in the field of neuromarketing carried out by neuromarketing practitioners are subject to fewer ethical standards than those of neuroscientists in the field of science (Illes and Bird 2006). This should be especially taken into consideration when studies are purchased from companies. This leads us to separate the ethics of neuroscience into the ethics of science (consumer neuroscience) and the ethics of practice (neuromarketing).

4.3 Analyzing Ethical Challenges in Neuromarketing

According to Briesemeister (2015), the NMSBA Code of Ethics is the state-of-the-art practical guideline for ethical behavior in neuromarketing. In this section, we carry out a comprehensive analysis of this Code of Ethics by taking into account recent developments in ethical perspectives and tool-specific aspects.

For this purpose, we reviewed 78 journal articles and books. We included those neuroscientific tools in our analysis that we could identify in the reviewed articles. For our analysis, we used the NMSBA Code of Ethics and the Neuromarketing Code of Ethics recommendation by Murphy et al. (2008) that refers to two main categories: consumer neuroscience and neuromarketing.

4.3.1 Protection of Research Subjects

The protection of research subjects includes the managing of clinical and incidental findings, procedures for informed consent, the influence of high incentives, and the rights of participants (e.g., withdrawing from a study) (Murphy et al. 2008). Subjects in academic and medical research who participate in neuroimaging-based studies are protected by Institutional Review Board guidelines. Such research

subject protections may not be present in the neuromarketing studies of commercial enterprises (Murphy et al. 2008).

Illes and Bird (2006) pointed out the need for guidelines to manage unexpected clinical findings in brain imaging research. How should scientists and practitioners handle incidental findings? Should they reveal their knowledge to the research subjects or save the data for subsequent medical use? Additionally, researchers should obtain the subjects' consent to participate in the study as volunteers (Sebastian 2014). The undue influence of incentives for participation on the validity of the study is also mentioned by Ulman et al. (2015): Researchers should be wary of effects that could result in indirect coercion of the research subject.

Furthermore, Roskies (2015) states that the central ethical issue of neuromarketing is related to the participants' rights, which include the right of privacy of thoughts, even though such a breach is technically not yet possible (Murphy et al. 2008), and data protection (Voorhees et al. 2013). Further rights include the right to be advised and informed about the study and the right to withdraw from a study for any reason (Ariely and Berns 2010; Ulman et al. 2015). Furthermore, the right not to be physically or psychically harmed belongs to this area of research subject protection (Shamoo 2010).

Although these considerations affect both consumer neuroscience and neuromarketing, the ethical aspect of protection of research subjects is more crucial in commercial neuromarketing studies than in consumer neuroscience research because there is less widespread knowledge of the ethical implications in this area.

4.3.1.1 Tool-Specific Investigation

This section investigates ethical aspects with respect to specific neuroscientific tools. Firstly, we recommend that researchers generally anticipate incidental findings in their experimental protocols. Illes et al. (2006) suggested that they should establish a pathway for handling them. Furthermore, participants should be informed in detail about the possibility of incidental findings before starting the research. This is particularly relevant for studies using fMRI: Approximately 1 % of the population could have an abnormal finding on their MRI or fMRI (Ariely and Berns 2010). And the percentage of such findings in MRI studies with adult volunteers varies widely between 18 % (Katzman et al. 1999) and 47 % (in different classification of required referrals) (Illes et al. 2004). The frequently used combination of MEG and MRI, to identify the neural source, provides another relevant example for the issue of incidental findings. This also applies to the usage of EEG, but the sensitivity to detect abnormal brain activity depends on the number of electrodes (up to 512 in some cases): An increasing number of electrodes improves the spatial sampling and therefore the chance to detect an incidental finding (Nelson 2008; Väisänen 2008). Other brain-imaging tools like PET (Lumbreras et al. 2010) and TMS (Farah 2010) could reveal such findings, too. All mentioned tools have in common that investigators have to be in a position to formally read the brain data

in order to ascertain whether there is abnormal brain activity (Nelson 2008). Furthermore, researchers should consult specialists (e.g., radiologists or lawyers) in case of an incidental finding. All these aspects should be discussed from an ethical point of view (Illes et al. 2006).

Another ethical aspect is informed consent. For this purpose, the scope and method of the research project, including information on technical issues, should be explained to participants in a clear and explicit way that anybody can understand (Ulman et al. 2015). The explanations that are required depend, inter alia, on the complexity of the neuroscientific tools. It can be assumed that complex brain imaging tools such as fMRI need more explanations than do psychophysiological measurements such as EEG. Whether it is more appropriate to inform the participants prior to or after the test depends on how much information can be given in advance without risking any distortion of the data.

Voluntary participation as a basic requirement related to ethical aspects of (neuromarketing) research is of particular relevance for psychophysiological measurements. In contrast to brain-imaging tools, some psychophysiological measurements can be taken, in principle, through covert observation. For example, intelligent watches such as the Apple Watch can measure heart rate[2] or even blood pressure.[3] Another example is Google Glass[4] combined with the app Shore (Frauenhofer IIS 2015), which can automatically detect human faces and emotions. As for facial expression and vocal characteristics, even though highly controversial when used to interpret specific emotions (Mauss and Robinson 2009), only a camera or a microphone is needed. Hence, especially for the abovementioned psychophysiological measurements, informed consent for participation should always be obtained.

The aspect of not harming participants in the process of obtaining the data is crucial with regard to participants' rights. Some neuromarketing tools can be uncomfortable, unpleasant, or even dangerous for the participants. For example, rapidly switching the radiofrequency pulse in the fMRI makes an extremely loud noise and can cause permanent hearing loss. Therefore, ear protection is a mandatory requirement. Additionally, the enclosed space and the requirement to keep still inside the fMRI can cause stress or even a traumatic experience (Senior et al. 2008; Zurawicki 2010). Current fMRI research uses a magnetic field strength of 1.5 or 3 T. All indications deem it harmless for human beings, as it is possible to scan humans with a magnetic field strength of 7 T and higher. Still, such high-field scanners can affect blood pressure, cardiac function, and neural activity. Studies have suggested that these effects are harmless, but little is known about the long-term effects of such high-field scanning protocols (Farah 2010). People with implanted metal objects should be excluded because of the magnetic field.

[2] See more details at www.apple.com/watch/health-and-fitness.

[3] See www.carunda24.com.

[4] This product, developed by Google, has been discontinued.

Some imaging or related techniques employing radiation (such as PET) or disrupting neural firing (such as TMS) may, under some regimes, potentially harm the subject. Participants in a TMS study should not wear metal devices nor have metal implanted in or near the head because of the stimulation of specific brain areas with magnetic field pulses. Adverse effects of TMS studies can be headaches and seizures. Seizures, though rare, are seriously adverse events that can lead to brain damage and death. Heckmann and Happel (2006) specify: "The number of individuals who have received TMS […] is likely in the thousands. Seizures during TMS are known to have occurred in seven individuals" (p. 81). The seizure risk is related to parameters of stimulation, e.g., pulse frequency. In special TMS versions that deliver pulses at a slow frequency (≤1 Hz, once per second), no seizures have been reported (Heckmann and Happel 2006).

In contrast to fMRI and TMS, PET is an invasive neuroscientific tool. Before scanning, a tiny amount of radioactive tracer has to be injected into or inhaled by the participant. Subsequently, its spatial distribution can be detected by a PET scanner. Because of these radioactive tracers, there are limits on the use of this method on healthy participants (Kenning et al. 2007).

With respect to MEG, implants or cardiac pacemakers must not contain metallic parts. To some extent, participants found that "it was an extremely uncomfortable procedure to undertake" (Senior et al. 2008, p. 161). The MEG helmet has to be positioned as close-fitting as possible to the participant's head, which may result in stress-inducing tightness (Senior et al. 2008).

4.3.1.2 Coverage by NMSBA Codes

NMSBA's code #3b (Disclosure of a protocol in case of incidental findings) covers the aspect of managing clinical and incidental findings, while codes #5b (Participants confirm understanding of the study), #4a (Voluntary participation), and #7a (Confirmation of voluntary participation by participants) cover the procedures for informed consents. These codes support the protection of human subjects with respect to their voluntary participation. The huge ethical aspect of participants' rights is largely represented by NMSBA in codes #6 (Privacy) and #7 (Participants' rights): for example, participants' right of privacy is regulated by #6b (Information about privacy policy before collecting insights) and #6c (No revelation of participants' identity). The NMSBA differentiates the right of data protection in several codes: #6d (Collection of personal data only for specific neuromarketing research purposes), #6e (Personal data are not to be kept longer than necessary), #6f (Protection against access to data), #6g (No sharing of research data), #7c (Personal data is not made available to others), #7d (Deletion of insights upon request), and #7e (Data protection when data is transferred across countries). The right of human subjects being advised and informed about the study is covered by #6a (Disclosure of purpose of collecting insights) and in part by #2b (No deception of participants). NMSBA codes #5d (Participants are free to withdraw) and #7b (Withdrawal of

participants at any time of the study) regulate the participants' right to withdraw at any time from the study. The right of human subjects not to be harmed is covered by #2a (No harm to participants).

4.3.1.3 Additional Aspects

One aspect that is not covered by NMSBA is how to determine the number of incentives for participation. Too many or too few incentives can lead to distortions in the participants' response behavior. Additionally, the participation of physically or mentally disabled persons should be regulated (Pop et al. 2014), at least in the demand for informed consent from their legal guardian. The NMSBA only covers the participation of children and young people younger than 18 years of age in #8 (Participation only with informed consent of parents). The authors also suggest regulating the participation of elderly people and adolescents. Steinberg (2002) argues that adolescence reaches into the early 20s and begins around age 10.

4.3.2 Protection of Vulnerable Niche Populations from Marketing Exploitation

A crucial ethical aspect of neuromarketing research is the protection of vulnerable niche populations that may be especially sensitive to advertising based on information derived from neuroscience (Murphy et al. 2008). Voorhees et al. (2013) enumerate the vulnerable populations: "children, the elderly, economically disadvantaged minorities, persons suffering from or vulnerable to addiction or compulsive behavior, or other members of traditionally protected groups" (p. 10). These groups have to be complemented by ill, disabled, or disadvantaged individuals (Javor et al. 2013), as well as adolescents, because of their biological vulnerability (Pechmann et al. 2005). Adolescents are fundamentally different from adults in terms of impulsivity, planfulness, and sensitivity to peer influence (Johnson and Giedd 2015). The brain system of teens underlies different conditions than those of adults. Teens' frontal lobe and amygdala are not yet fully formed (Durston et al. 2001). Furthermore, some researchers believe that teens' reward system (limbic system) is more reactive than that of adults (Galvan et al. 2006). The connection between the frontal lobe and the amygdala is also incomplete in teens. Thus, the frontal lobe exerts less control over the amygdala. It has less influence over emotions and behavior than the fully mature frontal lobe of an adult. In most cases, teens have less influence over emotions and behavior than fully mature adults (American Medical Association 2005). Hence, when corporations use neuroimaging data to target vulnerable groups with marketing activities, this has to be done without maligning, marginalizing, or causing psychosocial or financial harm (Murphy et al. 2008).

Vulnerable individuals are also people who are exposed to "stealth neuromarketing" techniques (Murphy et al. 2008). Stealth neuromarketing describes a scenario where neuromarketing is apt to manipulate consumer behavior, and the targeted consumers are unable to detect that they are being manipulated (Fisher et al. 2010). Judy Illes determines in an interview with Catherine Loiacono that such stealth neuromarketing is not possible using current neuroscience technology (Loiacono 2009). But if it were possible in the future, then it could endanger consumer autonomy, "so much so that it would fundamentally alter our understanding of autonomy and free will" (Fisher et al. 2010, p. 7). This code touches on both consumer neuroscience and neuromarketing. It can be assumed, however, that the commercial objectives of neuromarketing studies have a higher potential to exploit vulnerable niche populations than do consumer neuroscience studies that are conducted for scientific purposes only.

4.3.2.1 Tool-Specific Investigation

With regard to neuromarketing tools, individual tools are not particularly relevant—the protection of vulnerable niche populations from marketing exploitation affects neuromarketing as a whole. But the progressing developments in neuroscience technology in analytical tools (e.g., multi-voxel pattern analysis) or in the combination of methods suggest that, in the future, neuromarketing will reveal consumer insights in such a way that further ethical considerations become imperative (Ariely and Berns 2010; Sebastian 2014, p. 765).

4.3.2.2 Coverage by NMSBA Codes

The NMSBA does not fully cover the protection of vulnerable niche populations from marketing exploitation. Code #8 requires informed consent from parents when participants are under age; however, it only refers to participation in a neuromarketing study and not to exploitation by neuroscience-based marketing activities. Other vulnerable niche groups like the elderly; economically disadvantaged minorities; persons suffering from or vulnerable to addiction or compulsive behavior; ill, disabled, or disadvantaged/powerless individuals; and adolescents (over 18 years of age) are not covered by the NMSBA codes at all.

4.3.2.3 Additional Aspects

Code #8 focuses only on people under 18 years of age and only on the issue of participation, but there are also other vulnerable groups and persons. Therefore, the NMSBA code should include an additional code regarding the protection of vulnerable niche populations from marketing exploitation, i.e., related to their role as

consumers (Ulman et al. 2015; Olteanu 2015). Furthermore, with reference to technological progress in neuroscience, some day advanced technology might allow corporations to influence buying behavior (e.g., brand preference) without consumers being aware of the manipulation (Murphy et al. 2008). In this case, the NMSBA code should be extended by a code restricting the application of "stealth marketing" in general and with respect to specific advanced neuroscience tools in particular. Such an imperceptible manipulation of buying behavior through potentially advanced neuroscience tools is certainly to be regulated, which might lead to the regulation of the commercial use of single tools as well.

4.3.3 Full Disclosure of Goals, Risks, and Benefits

The ethical standards used in a neuromarketing study should be communicated transparently. This includes all verbal and written material within the complete study procedure (Murphy et al. 2008). This code addresses ethical aspects of consumer neuroscience and neuromarketing.

4.3.3.1 Tool-Specific Investigation

All neuromarketing projects have to communicate the goals, risks, and benefits of the investigation properly. But the communication process and especially the collection of material such as consent letters vary between different neuromarketing tools: for example, the explanation of fMRI technology to participants is much more extensive than is the case with eye-tracking tools. The following example shows how academic researchers describe the usage of fMRI in their study published in the academic journal Neuroimage: "[…] the participants did not report any history of neurological or psychiatric problems. The ethical review board of the VU Medical Centre approved of the study and all volunteers provided written informed consent (according to the Declaration of Helsinki) after the study procedure had been explained to them. They were paid €20 for participation… Before starting with the actual experiment, participants were instructed about the experimental set-up. Participants were then led to the scanner-room and positioned supine in the whole-body scanner, where they completed the actual experiment" (Van Dillen et al. 2009, p. 2). The educational level of the researcher who explains the technology also has to be appropriate to the standard of the tools. Sophisticated medical techniques need a more founded background to explain them properly. Furthermore, the disclosure of any risks should also take into account the tool-specific impacts. Far more aspects of risks are inherent to the usage of PET technology than, for example, in a reaction time test. Thus, PET has an invasive character, which the participants have to be

informed about. All in all, the level of tool complexity in connection with the level of intervention in the participant (invasive vs. noninvasive tools) determines the required level of enlightenment of participants.

4.3.3.2 Coverage by NMSBA Codes

NMSBA supports the aspect of full disclosure by different guidelines like #3a, which invites the public to report neuromarketing studies to the NMSBA before widely sharing their concerns or criticism. In so doing, NMSBA offers a central point of contact with the public. The idea of centralizing the concerns reduces the risk of publicizing misinterpretations. Misrepresentation can do considerable damage to the public's trust in science, may create anxieties about the perceived motivations of neuroscientists conducting human neuroimaging research, and generate a negative reputation of the sector as a whole. Academic and private sectors of neuroscience research need to maintain close partnerships and work together to promote public trust and investment in neuroscience research. That trust can be earned with forthright communication and full disclosure of risks, benefits, and limitations of the research findings (Murphy et al. 2008).

Additionally, code #4 (Transparency) underlines the importance of communicating the whole process accurately. According to #4c, neuromarketing researchers are required to allow their clients to audit the whole process of data collection and processing; #4d provides transparent creation, delivery, and documentation of projects. And code #4d highlights that researchers should not only allow but rather foster the communication and documentation of written and verbal clarifications. Furthermore, code #5 implies that researchers shall explain the tools they used to the participants (#5a), assure the participant's understanding of the protocols as well as the general objectives of the study before providing consent (#5b), and inform the participant about the project before any neuroscientific tools are used for neuromarketing data collection (#5c).

4.3.3.3 Additional Aspects

Researchers like Gerald Zaltman (2003) stress the importance of communication in the field of research on the subconscious mind of consumers: "Here I think all of us have a special responsibility to making clear, to consumers and managers alike, what we consider appropriate and inappropriate uses of knowledge. This at least will help lessen inadvertent misuse of knowledge" (Zaltman in Mahoney 2003). Some neuromarketing projects offend parts of code #5 (Consent by the nature of their study design). In some projects incomplete disclosure occurs during the consent process. That is when the research design does not allow for the participants to be fully informed about the goals of the research in advance, e.g., in order to minimize priming effects. In such cases, the American Psychological Association (APA)

recommends in its ethical guideline that researchers offer participants a proper debriefing. The goals of a debriefing are to inform the participant about the need why deception was necessary and the actual purpose of research. It is important to leave the participant with a positive attitude and emphasize their specific contribution to the research project (APA 2010, code 8.03). At this point, a tool-specific guideline is necessary to safeguard the participants' rights. Incomplete disclosure is questionable when tools are used that carry with them a high level of risk. This risk can also be an attack on privacy. Especially in a technology-driven media world, as already shown in Sect. 4.3.1, there is an increase in the possibility of gathering neuromarketing data participants are not aware of, such as with Apple Watch, Google Glass, or Nike FuelBand; hence, clear guidelines are mandatory in order to make it clear what is ethically correct in terms of full disclosure.

4.3.4 Accurate Media and Marketing Representation

Murphy et al. (2008) point out the absolute necessity of uncovering the neuroscientific measures and methods used in a neuromarketing project. They emphasize that at least the transparency of the scientific methods and the validity of measurement have to be guaranteed in business-to-business communication. This is important not only in order to maintain trust in public but also because it helps to "promote development of effective technologies" (Murphy et al. 2008, p. 299). This code primarily addresses (commercial) neuromarketing studies because in consumer neuroscience the aim is generally to publish results. Hence, in the academic context, the representation is usually subject to a double-blind review process that also includes high ethical standards.

4.3.4.1 Tool-Specific Investigation

The whole neuromarketing industry is affected by the problem of low trust. Although companies need innovative market research methods, there are still barriers (rooted in skepticism) to conducting neuromarketing studies. One of the main reasons is the industry's own fault: "Neuromarketing firms (not all of them, but enough to paint the whole field) have overpromised, underdelivered, and failed to provide a compelling value proposition to their customers" (Genco 2013). Especially the usage of cost-intensive and user-unfriendly tools like PET or fMRI should be weighed in terms of the achieved outcome and not be sold as "window into the brain" studies. It is imperative that companies open their black box of tools and measurement scales and not hide it in terms of intellectual property. Some companies, like Synetiq, foster EEG data development through an approach called "crowdsourced neuromarketing," which promotes transparency by sharing their program codes and the results of their studies (Probst et al. 2014).

4.3.4.2 Coverage by NMSBA Codes

The NMSBA supports the achievement of accurate B2B communication with code #1b, which requires that neuromarketing researchers avoid any actions that could have a negative impact on the reputation and integrity of the neuromarketing research profession. Additionally, code #1c demands that neuromarketing insights shall not be misinterpreted when they are communicated to the clients. In this way, the scientific character of the profession is clarified. Furthermore, code #4b requires that neuromarketing researchers operate a public website describing their services and the credentials of their core team members and providing a physical address where the company's officers can be contacted. Code #4d, mentioned in the context of Sect. 4.3.3 (disclosure of goals, risks, and benefits), also contributes to accurate communication.

4.3.4.3 Additional Aspects

The abovementioned codes emphasize the necessity of transparency in B2B communication but do not address the problem of industry-wide transparency. A major problem with the claims of the codes mentioned above is the business perspective of neuromarketing research and the fear of companies to share revealing knowledge with competitors. That is the case for neuromarketing research companies and their customers as well. Carl Marci[5] states: "In many cases, we have contractual obligations to keep things private for our clients" (Dana Foundation 2011). NMSBA code #4b is also difficult to achieve in practice and raises questions of more detailed rules to act ethically when it comes to accurate communication, e.g., on the website.

A study by Fisher et al. (2010) shows that there is still a need for action to develop framework conditions for neuromarketing studies. They examined 16 neuromarketing firms and discovered that only 13 described their methodology at all; furthermore, in many cases the descriptions were insufficient to actually determine what was being done. Fisher et al. (2010) fear that companies may be making premature claims about the predictive power of neuroscience for actual consumer behavior. The authors state that, on the basis of the studies included, they could not find much evidence that neuromarketing works or is effective; this might be because private companies have no incentive to publish their results.

As long as it is not clear what the term "transparency" actually implies, what exactly has to be made public (scales and measurement tools used), and where it has to be published, there will still be a large number of inaccurate presentations, and many question marks will remain over what and how things have been measured. This again does not help the overall neuromarketing industry and will not support a fast adoption of what might be useful knowledge. To achieve a

[5] Marci is Innerscope's M.D., CEO, co-founder, and Chief Science Officer, as well as the former Director of Social Neuroscience at the Massachusetts General Hospital.

higher level of credibility for low-cost technologies as well, it is necessary to set up academic projects with large sample sizes and publications in renowned journals (Probst et al. 2014).

4.3.5 Internal and External Scientific Validity

The most acute questions of validity arise over neurotechnology that can be used without a monitoring gatekeeper, such as the Food and Drug Administration (FDA) (Eaton and Illes 2007). "There are challenges in initial and sustained product validity in the commercialization of any marketing product influenced by neuromarketing research" (Murphy et al. 2008, p. 299).

In any case, internal validity tests should be carried out. A sufficiently comprehensive research database helps to provide effective and meaningful results to neuromarketing clients. In any research, development, and deployment of neuromarketing maintenance and efficiency verification, is imperative (Murphy et al. 2008). Regulations about internal and external validity are important for consumer neuroscience and neuromarketing. However, as already discussed in Sect. 4.3.4, academic studies usually support the highest standards of research, including internal and external validity, and therefore this ethical guideline should be followed in particular by practitioners.

4.3.5.1 Tool-Specific Investigation

As mentioned above, all neuromarketing projects need to ensure internal and external scientific validity, and this is a fundamental requirement all neuromarketing tools, too. There are no gradations with respect to the importance of the internal and external validity between the tools. The internal and external validity rather constitutes a basic requirement of serious neuromarketing studies.

4.3.5.2 Coverage by NMSBA Codes

NMSBA covers several aspects of the internal and external scientific validity of neuromarketing studies. Code #1a requires that neuromarketing researchers use accepted scientific principles and meet the highest research standards enforced in their respective countries. Additionally, according to code #10, researchers have to ensure, when they publicly share the results, which part of the report represents the interpretation of the data and which part of the data represents the key findings. Furthermore, neuromarketing researchers—in accordance with standard practice in scientific research—are not supposed to associate their names with a neuromarketing study unless they have actively participated in the project and are able to defend the findings. These codes support this demand for validity. The more complex the

methods, the more crucial it is to clarify in detail which results are reliable findings, and which ones are interpretation of the data. This is consistent with code #9 (Disclosure of subcontracted parts). The more people are involved in data analysis, the higher is the risk of mistakes and of misleading results due to overinterpretation of the findings. Moreover, there might be a prejudice that professionals like medics conduct studies more soundly than neuromarketers. For this purpose, code #2d, which demands that neuromarketing researchers disclose their skills and experience, is of great importance. A tool-specific training represents a prerequisite for an accurate internal and external examination of the validity of the data. Studies using more sophisticated medical tools should only be carried out by well-trained, qualified teams. For example, the analysis and interpretation of EEG data are more complex than eye tracking or facial expression analysis. Code #3b, which deals with incidental findings as discussed in Sect. 4.3.1, also supports the aim of ensuring the quality of data.

4.3.5.3 Additional Aspects

Code #1a (Highest research standards) should be specified. In addition to internal and external validity, which is the main focus of Murphy's Code of Ethics, additional criteria for assessing the quality of the data should be included.

To assess the quality of the data collected in a measurement process (regardless of the tools and methods used in a study), objectivity and reliability are imperative as well. Only when all quality criteria (validity, objectivity, and reliability) are fulfilled can sound conclusions be drawn from a study, and only then will the reproach that "Neuroimaging Studies are less reliable and generalizable than traditional marketing studies" (Plassmann et al. 2015, p. 431) be proved wrong.

4.4 Summary and Implications

On the basis of the theoretical foundations and practical aspects of neuromarketing tools, the present analysis of the NMSBA Code of Ethics delivers an overview of ethical challenges for academics and practitioners. The results of the analysis are summarized in Table 4.1.

Our discussion of the Neuromarketing Code of Ethics by Murphy et al. demonstrates that the NMSBA Code of Ethics is not yet complete in all the dimensions, as shown in Table 4.1. In addition, we could identify seven more important ethical codes that should be further focused on by practitioners and investigated by researchers. We also emphasize that the NMSBA codes are somewhat fuzzy because they are not described selectively, and there are some overlaps. Overall, one of the major challenges is the high dynamics in the neuromarketing industry, which makes it difficult to develop a comprehensive up-to-date guideline. The changing nature is closely linked to the ongoing technological development in soft- and hardware and

Table 4.1 Ethical challenges in neuromarketing from different perspectives

Neuromarketing code of ethics by Murphy et al.			1. Research subjects	2. Vulnerable populations	3. Full disclosure	4. Accurate representation	5. Scientific validity	Special relevance for single tools
NMSBA code of ethics	#1 Core principles	(a) Highest research standards					x	
		(b) Protection of neuromarketing (NM) integrity and reputation				x		
		(c) No misinterpretation of NM insights				x		
	#2 Integrity	(a) No harm to participants	x					fMRI/PET/MEG/TMS
		(b) No deception of participants	x					
		(c) No sales to probands as a direct result of study	x					
		(d) Honesty about researchers' skills and training					x	
	#3 Credibility	(a) Contact NMSBA when concerns or criticism occurs			x			
		(b) Disclosure of a protocol in case of incidental findings	x				x	fMRI/PET/EEG/MEG/TMS
	#4 Transparency	(a) Voluntary participation	x					Heart rate/blood pressure/voice analytics
		(b) Address and services provided on researcher's website				x		fMRI/PET/EEG/MEG/TMS
		(c) Clients' audit of data collection/analysis			x		x	
		(d) Transparent creation, delivery, and documentation of projects			x	x		fMRI/PET/EEG/MEG/TMS
	#5 Informed consent	(a) Tools are explained to participants			x			fMRI/PET/MEG/TMS
		(b) Participants confirm understanding of the study	x		x			fMRI/PET/MEG/TMS
		(c) Full information of participants			x			fMRI/PET/MEG/TMS
		(d) Participants are free to withdraw	x					Heart rate/blood pressure/voice analytics

(continued)

Table 4.1 (continued)

Neuromarketing code of ethics by Murphy et al.			1. Research subjects	2. Vulnerable populations	3. Full disclosure	4. Accurate representation	5. Scientific validity	Special relevance for single tools
	#6 Privacy	(a) Disclosure of purpose of collecting insights	x					fMRI/PET/MEG/TMS
		(b) Information about privacy policy before collecting insights	x					
		(c) No revelation of participants' identity	x					
		(d) Collection of personal data only for specific NM research purposes	x					
		(e) Personal data are not to be kept longer than necessary	x					
		(f) Protection against access to data	x					
		(g) No sharing of research data	x					
	#7 Participants' rights	(a) Confirmation of voluntary participation by participants	x					Heart rate/blood pressure/voice analytics
		(b) Withdrawal of participants at any time of the study	x					Heart rate/blood pressure/voice analytics
		(c) Personal data are not made available to others	x					
		(d) Deletion of insights upon request	x					
		(e) Data protection when data are transferred across countries	x					

	#8 Children and young people	Participation only with informed consent of parents	x	x				
	#9 Subcontracting	Disclosure of subcontracted parts			x		x	
	#10 Publication	Actual key findings vs. interpretation of data				x	x	fMRI/PET/EEG/MEG/TMS
	#11 Commitment	Commitment to application of this code						
	#12 Implementation	(a) Code is applicable to everyone involved in an NM project						
		(b) Mandatory publication of the code						
Additional ethical codes	Incentives should be appropriate to avoid distortions of participants' behavior		x					
	Prevent manipulation of consumer behavior ("stealth marketing")			x				
	Protect vulnerable groups (e.g., elderly, infants, disabled) from marketing exploitation			x				
	Participation of vulnerable groups (e.g., disabled, adolescents, elderly) should be subject to particular care		x					
	Debriefing in case of covert data collection/incomplete disclosure				x			
	Disclosure of tools and measurement scales when possible					x		
	Ensure detailed rules for acting ethically with respect to communication of neuromarketing results					x		

should be taken into account by all parties involved. The combination of different tools adds another layer of complexity to the question of what is ethically correct. New tools will be developed in the future, and existing evaluation algorithms will be constantly improved. This, in turn, requires a continuous review and adjustment of the existing codes of ethics.

Furthermore, we pointed out the ethical problems due to the non-separability of academic consumer neuroscience and applied neuromarketing. Academics and industry should cooperate more closely in order to learn from each other and transfer important knowledge, also with respect to ethical questions. One overarching code of ethics should cover both worlds. Developing a guideline with the standards of academics and the specific characteristics of different tools would help to overcome many ethical challenges. It would lower the chance that ethically flawed studies will be conducted and the neuromarketing field would be given more confidence. A merging of the two areas would increase the public's trust in neuromarketing tools and studies (Murphy et al. 2008).

This point is in line with the statements of Harvard Professor Karmakar, who advises companies to "[…] look for a company whose employees have a healthy, skeptical respect for neuroscience and make sure it was started by a scientist, or has a good science advisory board" (Karmakar in Nobel 2012). To both neuromarketers and consumer neuroscientists, Karmakar explains: "It's similar to the concerns about genetics. People wonder, now that we can map the genome, are we going to manipulate the genome? I think it's a valid and important question to ask. But I don't think it's the direction that companies should take or that academics are taking. As academics, neuroscience just helps us to understand how" (Karmakar in Nobel 2012).

The potential of neuromarketing can only be exploited if trust in the industry rises, and this strongly correlates with ethically correct behavior when using neuromarketing tools. Both academic researchers and practitioners need to consider ethical questions not only in general but also based on the characteristics of the different tools.

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Chapter 5
Ethical and Legal Considerations in Research Subject and Data Protection

Eugenia Laureckis and Àlex Martínez Miralpeix

5.1 Introduction

The world is changing and marketing is not an exception. In recent years, companies increased their interest in the application of new techniques to better understand their consumers and how they are reacting to different stimuli (Pop and Iorga 2012). Although some of these techniques are used in other disciplines such as neurology, the application to market research is growing rapidly and providing a new perspective in this sense and contributing to better understand and predict consumer behavior.

The classical paradigm of the pure rational humans is being questioned by several well-recognized authors such as Daniel Kahneman (2011) or Antonio Damasio (2008). Our decisions are emotional and we are not even aware of them. Furthermore, and instead of the traditional theory of decision making that states that we try to maximize value, we are taking decision based on our own interest (Pop and Iorga 2012).

Among these new disciplines, neuroeconomy is bursting in with force. This interdisciplinary field at the border of neurosciences and economy aims to build neuronal models for decision-making process in the economic context. With the help of neuroimaging—the use of neurobiological methods such as the electroencephalography (EEG) or the direct observation of brain processes through methods such as functional magnetic resonance imaging (fMRI)—researchers can study brain activity "in vivo," as a reaction to certain stimuli (Pop and Iorga 2012). The cost of using the equipment is going down, and this aimed researchers to use them in large scale to have the possibility to correlate processes such as decision making among others (Pop and Iorga 2012). Such techniques finally allow marketers to probe the consumers' brains in order to gain valuable insights into the subconscious

E. Laureckis (✉) • À.M. Miralpeix
EEN Business School, Madrid, Spain
e-mail: eugenia@neurostrategy.net; alex@neurostrategy.net

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processes (Morin 2011a, b). But it has the risk of using them without the adequate knowledge. In this sense, we can find practical problems in relation with ethics and the interpretation of the results.

As Kenning states (Kenning et al. 2007) the integration and application of neuroscientific theories, concepts, and methods to do research in consumer behavior are increasing in recent years. And more recently, modern techniques and methods used in neuroscience offer a methodological advantage to a better understanding of human behavior. The scientific proceeding of this approach is subsumed under the term "consumer neuroscience" (Kenning et al. 2007); whereas "neuromarketing" points to the application within the scope of managerial practice (Kenning et al. 2007; Hubert and Kenning 2008; Ariely and Berns 2010). "Neuromarketing" is a new field of science that implies the combination of two other fields, neuroscience and marketing, to approach consumer behavior from a brain perspective (Morin 2011a, b). Controversial since the beginning in 2002, when few US companies like Brighthouse and SalesBrain became the first to offer neuromarketing research and consulting services advocating the use of technology and knowledge coming from the field of cognitive neuroscience. Morin, using an analogy, also states "that Neuromarketing is to marketing what neuropsychology is to psychology" (Morin 2011a, b).

Traditional market research methods have demonstrated some inconvenience to gather reliable data. These methods depend on consumers' self-report while it is not easy for them to describe how they feel when they are exposed to stimuli (Morin 2011a, b). Consumers sometimes are not able to say what "they want" and "what they need." They find difficulties to describe what they are experiencing although in a confidential way, or even they can feel certain pressure of other participants or because of the specific topic. Other situations that can be found are the different roles developed in a focus group. This bias studied in social psychology appears when one person is stating an opinion influenced by the leader of the group.

Morin (2011a, b) clearly states that neuromarketing offers cutting-edge methods for directly probing minds without requiring demanding cognitive or conscious participation.

According to the American Research Foundation (ARF), neuromarketing is expanding rapidly. This process can be faster if marketing researchers understand the real advantages of all neuromarketing techniques. But they also stated something very important, which is long feared the public outcry against potential ethical and privacy issues introduced by the use of neuroimaging technology for commercial purposes. According to the ARF, "It appears that this rapid increase in interest and use of biometrics and neurological methods is fueled by five developments" (Barwise et al. 2011):

- *Advances in neurological science*: Neuroscientists are conducting more studies on issues of interest to marketers, such as the regulation of emotions, understanding of reward systems, and decision-making processes. Although there are still debates and lack of agreement among neuroscientists about many aspects of this discipline and its research methods, the advances in the field have made it possible to achieve more conclusive insights.

- *Technological advances in neuroscience methods and tools* are another important factor promoting the growth of neuromarketing research; allowing less intrusive studies with more detailed information about the brain's response to stimuli. Portable devices and the cost of using such technologies going down are other factors that contribute to encourage marketers to try new techniques.
- Marketers' growing interest in consumers' unconscious and emotional reactions to marketing messages and better measures of emotion, arousal, and implicit memory: As Morin states (Morin 2011a, b) since emotions are strong mediators of how consumers process messages, understanding and modeling cognitive to responses to selling messages has always been a methodological challenge.
- *A competitive marketplace* in which more effective advertising and more accountability of marketing performance are demanded: There is pressure to optimize advertising effectiveness and accountability. Again, neuromarketing research provides new ways to contribute to those goals.
- *Growing evidence for successful applications of neuroscience methods to marketing* and successful case is encouraging companies to apply neuromarketing techniques. The ARF informed that in a number of conferences research companies and their clients shared cases that used neuromarketing research methods to gain learning on topics such as "identifying superior creative executions, documenting impact on attention or evaluation of commercials" (Barwise et al. 2011).

As a result, the use of neuroscience in marketing has both advocates and critics. There are several opinions against neuromarketing and the inherent risks of using innovative techniques for commercial purposes.[1] Advocates of neuromarketing propose that the combination will allow consumers and marketers to better understand consumers (Wilson et al. 2008). On the other hand, critics warn that consumers' ability to make logical, informed decisions about purchases will be compromised (Wilson et al. 2008). In any case, there is no doubt that neuroimaging methods will bring significant changes to marketing persuasion.

Recent research on addictive shopping or buying compulsion is making awareness among consumers and companies[2] and contributing to generate a more effective relation between them (Kenning and Linzmajer 2011). Neuromarketing discoveries may help to protect themselves, not to generate a new issue.

Neuromarketing itself includes more than the use of neuroimaging for commercial purposes. Neuroethics should be applied to all actions done in research involving those techniques, too, and be circumscribed not only to the ethical concerns but also to the legal and social policy implications of neuroscience (Illes and Bird 2006).

Neuromarketing is here to stay; it's not a summer fashion. And as professionals or academics in this field, we need to contribute to improve this discipline.

[1] Commercial Alert retrieved from http://www.commercialalert.org/issues/culture/neuromarketing.

[2] As examples stated by Kenning and Linzmajer (2011) state some research done by Hubert et al. (2011) of addictive shopping behaviors or Samanez-Larkin et al. (2007) of how perceptions change with aging.

5.2 Ethical Considerations on Neuromarketing Research

At the same time neuromarketing companies are increasing their business, ethical issues arise. The concern is growing among government regulators and consumer advocates. They argue that these techniques can open the door to new forms of consumer deception and further erosion of privacy rights (Voorhees et al. 2011).

Anticipating ethical challenges is crucial in developing methods for effective research, as it also represents the aim of neuroethics (Olteanu 2014). In a simplistic manner, neuroethics is dedicated to protecting human subjects that participate in marketing experiments which use neuroimaging technologies. It is not the same to scan brains, which has more profound implications—in some cases clinical implications can arise—than scanning any other part of the body (Olteanu 2014).

Neuromarketing itself comprises more than the use of neuroimaging for commercial purposes. In this sense, neuroethics should be applied to all actions done in research involving those techniques and be circumscribed not only to the ethical concerns but also to the legal and social policy implications of neuroscience (Illes and Bird 2006).

One of the first articles proposing a Code of Ethics for Neuromarketing was that of Emily Murphy, Judy Illes, and Peter Reiner in 2008. The main guidelines were built on three basic pillars: (Murphy et al. 2008).

– *Protection of research subjects*: Policies for responsibly managing clinical findings including provisions of sufficient subject protection, procedures for informed consent, and explicit protocols for dealing with incidental findings.
– *Protection of vulnerable niche populations from marketing exploitation*: Policies for research subjects' protection. All the information should be complete and presented in a friendly way with a simple language.
– *Full disclosure of goals, risks, and benefits*, taking into account any potential harm or nuisance however small or oddly enough to appear.

In this sense, and specifically, one of the most important milestones of the Neuromarketing Science and Business Association was to publish in 2013 the Code of Ethics (http://www.nmsba.com/ethics), mandatory for all members around the world. The Code of Ethics of NMSBA is a "live code." It will incorporate improvements from the international community. This Code of Ethics "represents a first step towards adopting international standards applied to using neuroscientific methods to study the effectiveness of advertising campaigns, packaging and product design, as well as communication campaigns from non-profit organizations and government institutions."

> The purpose of the Code of Ethics for the Neuromarketing industry is to address three important issues:
>
> - Restore the *confidence* of the public in the legitimacy and integrity of neuromarketers;
> - Ensure neuromarketers protect the *privacy* of research participants;
> - *Protect* the buyers of neuromarketing services

NMSBA members will respect these principles as a condition of membership.

Ethics, privacy, and confidentiality should be assessed in every research to make sure that researchers are respecting participants' rights. Neuromarketing research should take into account three main responsibilities: towards subjects, data, and consumers:

1. *Responsibilities towards subjects*

> "Neuromarketing researchers should have a clear idea about the criteria of inclusion and exclusion of potential subjects to accomplish a relevant study. Subjects should be notified the proposed of the research at least up to a certain extend taking into account that in some cases, explaining so much about the purpose can damage the results" (Olteanu 2014).

Subjects should know which techniques will be used, the steps to be done, and any associated risk. Language should be clear, nontechnical, friendly, and close to the subjects.

At the end of the study, subjects should be informed on the results and findings should be published if they are appropriate and do not present risk to the community of population or a defined group of people (Olteanu 2014).

Going further in the kind of policies involved in brain research, procedures for informed consent or explicit protocols for dealing with incidental findings (Illes and Bird 2006) are extremely important.

Although most technologies used in neuromarketing may have a minimal risk, it is advisable to remind participants that they have a right to quit the research being carried out at any moment and for any reason (Murphy et al. 2008).

As researchers we really need to make the research subjects feel comfortable and avoid any discomfort they can experience during the research.

In this sense, the NMSBA Code of Ethics in Chap. 8 clearly determines participant rights. These principles are very important to protect participant's rights and promote confidence to them. Participants are not obliged to participate in any project and they can decide not to continue at any time or even request deletion or modifications. In relation to their guarantees, they shall be guaranteed that their personal data is not available to others or their rights are protected when data is transferred.

2. *Responsibility towards consumers*

In traditional market research approach, respondent's sincerity sometimes is questioned when using surveys. Using neuroimaging tools eliminates those disadvantages and offers information regarding consumer's unconscious reactions to the stimuli. And after completing the study, researchers are responsible for dealing with the results to the benefit of consumer (Olteanu 2014).

As researchers, we need to not only be honest with the results if we can publish them but also try to improve our discipline.

Any neuromarketing private research company can freely choose their clients and what to research on, but there are some controversial industries that can take advantage of these cutting-edge techniques.

Consumer free will comes from moral responsibility and people are responsible for their actions only when free will is involved. Regarding the use of neuromarketing

in order to develop advertisements, products, or packaging, consumers have the final word in choosing a product or service (Olteanu 2014). Nowadays, consumers have at a glance a lot of information available to choose and take decisions. In this sense, consumer's mind is not altered so as to prefer a product just by having done neuroimaging techniques.

3. *Responsibility towards data*

As researchers we should be careful with the data gathered during our research. In our daily work, we have a growing dependence on computers, Internet, and cloud databases. Individual privacy is a great challenge in research. When data are collected and stored, privacy and confidentiality issues may come across. And both have become crucial in the research subject relationship. According to the UE directive from 2016 "it gives citizens back control over of their personal data, and to simplify the regulatory environment for business. The data protection reform is a key enabler of the Digital Single Market which the Commission has prioritized. The reform will allow European citizens and businesses to fully benefit from the digital economy." Companies are obliged to give to individuals the option to manage the personal data, especially in the digital world.

4. *Responsibility towards the company*

Companies rely on the companies they contract to do research. As researchers, we need to give our customers full security on our own work and we need to generate a mutual confidence that we are fulfilling research protocols.

5. *Connection between responsibilities*

According to Nello (2000) we have to be careful with these four elements, because they are not separated; these are connected. Nello (2000) states that this is the circumscribed square of professional ethics. The researcher is the connection between these four elements and he or she has to coordinate them to apply neuroethics correctly.

5.3 Privacy, Confidentiality, and Legal Issues

According to the White Paper "Neuromarketing: legal and policy issues" (Voorhees et al. 2011), neuromarketing, as currently employed, can raise some issues about collection, storage, and use of data gathered with volunteers in laboratory. The privacy issues associated with neuromarketing are thus more likely to implicate the notion of privacy as limited access to the self. As discussed above, they can be considered ethical implications. To summarize it somehow, we can say that observing the brain can void some privacy rules (Nogués 2014).

According to the European Commission in "Data protection and privacy ethical guidelines" (2009) and the Report on Current Issues in Research Ethics from

Columbia University (2015), the way data protection and privacy issues are taken into account and formally treated fundamentally depends on the legal environment of each country where the research will take place. And depending on that, applicants need to provide the appropriate authority with a detailed description of the proposed data collection and the methodology used for collecting, using, and storing of personal data. Data protection is key for reducing risk and can include activities such as:

1. Identifying who has access to the data
2. Identifying who is maintaining the confidentiality of the data
3. Describing the measures for protecting the physical security and software security of the data
4. Ensuring that authentication and authorization are required for those who have access to medical data by providing firewalls, data encryption, and password protection
5. A contingency plan for dealing with any breach of confidentiality
6. And of course, accomplishing the Data Protection law from each country

Data protection levels will vary depending on the type of research carried out.

5.3.1 What Is Privacy?

According to Report on Current Issues in Research Ethics from Columbia University (2015), privacy can be defined in terms of a person having control over the extent, timing, and circumstances of sharing oneself (physically, behaviorally, or intellectually) with others. Privacy refers to the right of individuals to limit access by others to aspects of their person that can include thoughts, identifying information, or any other information that can identify a person. According to the European Commission in their report on "Data protection and privacy ethical guidelines" (2009), privacy concerns any data which, either alone or when linked to other, relate to an identifiable individual or individuals. Consider privacy as a basic human right and maintaining confidentiality as a professional obligation.

Data privacy involves the right of any individual to expect that personal information collected about them will be processed securely and will not be disseminated in any form without their written consent.

In this sense, the NMSBA Code of Ethics in Chap. 7 determines that researchers shall have a privacy policy accessible to participants. In relation to their guarantees, they shall be guaranteed that their personal data is not available to others or their rights are protected when data is transferred and it is ensured that participants are aware of the purpose of collecting insights. The identity of participants will not be revealed without explicit consents and the information collected shall be for specified neuromarketing research purposes and not others.

5.3.1.1 Privacy and Informed Consent

According to the European Commission in their report on "Data protection and privacy ethical guidelines" (2009), by signing the informed consent, volunteers control their privacy for a specific purpose and specific period of time. Individuals need to be aware of the:

1. "Methods used for handling personal data"
2. "Justification for requesting/obtaining their data"
3. "Duration of data storage"
4. "Guarantees concerning the rightful use of data"

All study participants present in a research project need to be informed about the planned research, use of the collected data independently of the type of data collected. Participants need to be informed how personal data is planned to be handled and to provide the appropriate authorization.

Critical aspects of informed consent are the following:

1. The potential participant must be given sufficient information in order to be able to make a choice of whether or not to participate, taking into account the risks, alternatives, and being free of any coercion.
2. The decision of the potential participant on the consent issue must be evidenced. Participants must agree that data will be used for a specific research, scope of research, and warnings.
3. The potential participant must know if the researchers are using some invasive or noninvasive technique.
4. Participants should know any possible sequels and if they can be reverted.
5. If the researches are using a "blind technique" in the experiment, subjects should be given enough information of it.

Protocols should be done in a way that creates confidence in the volunteer making him/her to feel comfortable. Using technical words in the informed consent might be an obstacle to give an understandable message. If our volunteer doesn't understand, he will be uncomfortable and unconfident with the research.

If applicants wish to include either children or adults who are judged not to have legal competence to consent for themselves in order to participate in research projects, they must prove that the inclusion of such participants is necessary and the people who are legally responsible from them have sufficient information that allows them to make the informed consent choice.

In the specific case of children and young people, NMSBA states in article 8 that participants under 18 years old need the consent of their parents.

To maintain data privacy, researchers should create a framework of security measures to guarantee that data is kept safe from unforeseen, unintended, unwanted, or malevolent use or trying to transfer illegally. And it concerns mainly three main things: access to data—how they are accessed and if they are properly protected; conservation of data—where and how long are the data stored and archived; and accuracy—how to maintain and update data. Duration of data protection and means

of irreversible data removal should be clearly defined in the research protocol. References to the data protection law of the country should be included in the informed consent.

5.3.2 What Is Confidentiality?

As privacy relates to the research participant's direct disclosure to the researcher, the European Commission (2009) describes confidentiality as related to the extent to which the researcher protects the participant's private information. This is a process that involves a relationship of trust, and of course, the expectation is that this information will not be divulged to others without the participant's permission.

There are many specific topics that fall under the section of privacy and confidentiality that are essential to be considered by today's researchers. To increase awareness of protecting privacy and maintaining confidentiality in the research setting has become critical, complex, and challenging nowadays.

According to the European Commission, some benefits of maintaining confidentiality are the following:

- It helps establish trust between the research participant and the researcher.
- It reduces worry on the part of the individual.
- It maintains the participant's dignity.
- The participant feels respected.
- It gives the participant control and promotes autonomy.

As stated before, if researchers cannot ensure that data collected is safe, volunteers may not want to accept to participate in research. It is researcher's obligation to protect such confidentiality. Trust encourages research participants to communicate honestly and openly with researchers.

5.4 Potential Legal Issues

According to the White Paper "Neuromarketing: legal and policy issues" (Voorhees et al. 2011) neuromarketing methods and goals potentially raise legal issues for those engaged in this practice. Advertisers face various forms of potential legal challenges to their use of neuromarketing.

As neuromarketing techniques become more sophisticated and more powerful, the industry will likely face increasing resistance from regulators concerned that consumers are being misled into believing that they want or need a product they have no use for, or deceived into thinking that a purchase arises from their rational choice whereas in fact they are being induced to act based on stimulated subconscious impulse.

As stated before, privacy issues concern among regulators and the general public may arise as aggressive claims by neuromarketers and the power of their techniques to understand brain function and impact behavior. But as Morin states (Morin 2011a, b) in relation to Fisher and other colleagues of Harvard University "the current state of imaging technology does not allow for accurate, deterministic predictions of human decision making" (Morin 2011a, b; Fisher et al. 2010). In the case of neuromarketing research, as long as a participant provides consent, privacy is protected, and confidentiality is guaranteed, we could not say that we are not complying with the laws.

Indeed, we consider very helpful for this discipline initiatives like the Advertising Research Foundation with a NeuroStandards Collaboration Project[3] to test the scientific validity of neuromarketing methods currently in use. In this sense, also, NMSBA decided to create an "Accredited Corporate Member," a new membership category. The accreditation process includes evaluation of methods used and regulation procedures. The aim is clear: expand the understanding of neuroscience's role in marketing field and get a wider acceptance of this discipline worldwide. Overregulation can be self-defeating but standards for the industry are really necessary to contribute to alleviate government, private, and public concerns about neuromarketing.

5.5 Neuromarketing and Consumer's Free Will

Adding techniques of neuroimaging to the advertising industry can improve their capabilities. This is good or bad for consumers … as it has always been debatable (Madan 2010). Advertisers have developed more and more creative ways to influence consumers. However, there is a fine line between being influenced and being manipulated (Morin 2011a, b).

Although it is not the topic of this chapter, we would like to make a brief comment on neuromarketing and consumer's free will as it is related to the outcome of the research done.

Issues about freedom of will, privacy rights, and development and dissemination of advertisements by business operations are broadened significantly by the inclusion of neuroscience methods and findings (Wilson et al. 2008). While the concerns about privacy violation appear legitimate, published studies demonstrate as of yet a very limited ability for neuroimaging studies to decode our private thoughts (Morin 2011a, b).

But the improvement in ethics in this field as in any other scientific research discipline is not less important in commercial research; only good can come from the pairing of the commercial principles of economics with the learning principles of psychology and neuroscience (Madan 2010).

[3]The AFR Neurostandards can be accessed at http://mobdev.thearf.com/neurostandards-collaboration.

The customer mind is uncontrollable and neuroscience can help understand customer's needs (Vashishta and Balaji 2012). But this cannot be done at the expense of consumer's privacy neither consumer's free will.

On the other hand, the word "subliminal" conveys the notion that a stimulus is having an effect below our level of conscious awareness. There is research evidence confirming that subliminal effect does exist. There are messages that achieve virtually undetectable impact and can be considered subliminal because they do act below the level of consciousness (Morin 2011a, b).

Morin states in his paper "Neuromarketing" (Morin 2011a, b) that Kathleen Taylor, a research scientist in the Department of Physiology, Anatomy, and Genetics at the University of Oxford, recognizes that the use of excessive emotions by advertisers is an effective way to trigger buying responses below the level of consciousness. Likewise, excessive repetition of a simple message creates patterns of activity in the brain.

There is still a lot to do. There is still a lot of academic research to be produced to improve future policies and increase protection of consumers from highly manipulative strategies (Morin 2011a, b).

5.6 Final Reflections and Future Perspectives

Altering traditional practices, some of them established for years, can be controversial. Neuromarketing arose as an innovative technology and it is in its infancy. Clear regulations, practical protocols, tests to evaluate the ethical suitability for each case, or "neurostandards" may improve the credibility to this discipline.

We have a lot more to understand about human behavior, emotions, decision making, cognitive process, and, definitely, how we react as human beings.

Ethical, privacy, and legal issues appear and will probably remain. So we need to address them as professionals in this field and work them out. Despite the brief story of neuromarketing, we have come a long way but we still have a lot to do.

And just to finalize, we would like to tell our readers a story. And let's think in the development of the bicycle. This analysis was made by Trevor J. Pinch and Wiebe E. Bijker according to the social construction of technology theory (Pinch and Bijker 1984). In a simplistic way, some groups were against this new technology. They thought—for example—it was harmful. Some others were defending it as it was useful. The perception of the same "artifact" was totally different from one group to the other. Improvements in technology came from the friction of those relevant groups. Problems were solved as time went by and today we think no one doubts of bicycles. Changes appear to be hard in the beginning. But it is very probable that the same can happen with neuromarketing and traditional marketing techniques. Not only traditional research and neuromarketing techniques can improve marketing but also, if we are able to use them well, we can shape a better humankind and get a better understanding of human behavior. Last but not least, it is not only our goal as researchers, professors, and neuromarketing consultants but also one of many other practitioners around the world who are working in this direction.

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Chapter 6
Transparency and Reliability in Neuromarketing Research

Arianna Trettel, Patrizia Cherubino, Giulia Cartocci, Dario Rossi, Enrica Modica, Anton Giulio Maglione, Gianluca di Flumeri, and Fabio Babiloni

6.1 Introduction

It is well known that the "conventional" marketing research typically uses surveys to acquire the explicit preferences of consumers. This approach is based on the assumption that the consumer is a full rational agent that generates purchasing decisions on the base of the maximization of some economic function related to objective value of the goods and its capability to spend. However, the current trends of scientific investigation in the field of neuroscience are suggesting that human decisions (including the economic ones) are not completely determined by a fully rational assessment of pros and cons on behalf of the acting individual. Instead, it has been suggested that different emotional factors play an important role in individual decision making, and also in the economic and purchasing contexts (Ariely 2009; Ariely and Berns 2010; Kahneman 2011).

For this reason, in the recent years there was a clear interest for the use of brain-imaging techniques for the analysis of brain responses to commercial stimuli by using both hemodynamic (Bruce et al. 2014) and neuroelectromagnetic measurements (Silberstein et al. 2000; Ioannides et al. 2000). These hemodynamic and neuroelectrical measurements are also employed to investigate the purchasing

A. Trettel (✉)
BrainSigns, Rome, Italy
e-mail: arianna.trettel@brainsigns.com

P. Cherubino • G. Cartocci • D. Rossi • E. Modica • A.G. Maglione • G. di Flumeri
F. Babiloni
Sapienza University of Rome, Rome, Italy
e-mail: patrizia.cherubino@brainsigns.com; giulia.cartocci@brainsigns.com; dario.rossi@brainsigns.com; enrica.modica@brainsigns.com; antongiulio.maglione@brainsigns.com; gianluca.diflumeri@brainsigns.com; fabio.babiloni@uniroma1.it

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attitudes of groups of consumers (Vecchiato et al. 2011). Such interest is justified by the possibility to statistically correlate the observed brain activations with the proposed commercial stimuli, in order to derive conclusions about the adequacy of such stimuli in terms of interest or emotional engagement for the investigated sample. The application of the neuroscience concepts and methodologies to the consumer research has developed under the label of "consumer neuroscience." Its goal is to use insights and methods from neuroscience to enhance the understanding of consumer behavior. So far, adopted standard marketing techniques often involve the use of in-depth interviews or focus groups during which customers are exposed to the product before its massive launch (ad pretest) or afterwards (ad posttest). However, it is now recognized that the verbal advertising pretest is biased by the respondents' cognitive processes activating during the interview, as well as the interviewer may have a great influence on the respondent's recalls (Zaltman 2003). In fact, the consumer neuroscience is thought to reveal information about consumer preferences that are unobtainable with conventional interviews (Ariely and Berns 2010). In particular, it was thought that the use of neuroimaging could bring "qualitatively different information ostensibly superior to that obtained by traditional means, about the economically valuable topic of consumer preferences" (Murphy et al. 2008). Of course, such position is not supported unanimously in literature and some concerns about the possibility of neuroscience to explain human being or its economic behavior have already been raised (Crawford 2008).

Nowadays, the term employed for describing the practical application of consumer neuroscience principles and methodologies to the evaluation of commercial stimuli is "neuromarketing." This "neuromarketing" label is then applied to the studies and reports provided by many specialized companies that are actually providing neuroscience-based services to the interested industries in these last years. Neuromarketing has received considerable attention in the corporate world, and the growth of neuromarketing companies over the last decade has been impressive. More specifically, neuromarketing has been defined as the field of study that applies the methodologies of the neuroscience to analyze and understand the human behavior related to market and economic exchanges (Lee et al. 2007). Hence, the contribution of neuroscientific methods becomes significant for the knowledge of the human behavior in the marketing scope. Moreover, another interesting issue is overcoming the dependence from the verbal answering nowadays used on testing subjects in traditional marketing researches where insights and indicators depend on the good faith and accuracy of the experimental subject reporting his/her own sensations and opinion to the experimenter. Instead, the use of the brain-imaging technique can distinguish the subject's cognitive and emotional experiences (verbally expressed during the interviews) from the activations of cerebral areas related to different, and unconscious, mental states. Interesting experimental evidences suggest that the use of the brain imaging, in a near future, could be adopted side by side to classical tests, today largely used in the marketing sciences (Vecchiato et al. 2013).

6.1.1 Issues Related to the Transparency and Reliability of Neuromarketing Research

The popularity that science has in the modern Western societies, mainly based on the real and tangible advantages that technology brings in the ordinary day life of each citizen, has further pushed the credibility of the neuroscience concepts to be applied to different aspects of life. In this context, also the application of the neuroscience to the economic matter has interested the public and generated a lot of debate. The exponential growth of scientific papers that are employing neuroscience-based technologies to assess consumer's decision-making interest for marketing campaigns is almost parallel to the increasing number of available neuromarketing companies (Plassmann et al. 2012). Customers of such neuromarketing companies now include also "big players" like Google, main telecoms of different countries, Microsoft, Walt Disney, Chevron, and others (Burkitt 2009).

Thus, there is currently the idea that information that comes from the very deep inside of the person (as collected from one of the different neuroimaging devices available today) could be combined with the information that comes from the analysis of the over-behavior of a multitude of persons through the "big data analysis." This joint analysis may increase the predictive power of marketers and offer a richer and detailed picture of the consumer than that is available today (Chester 2012). The hope is that this increased insight of the consumer's needs could bring to the people the products they really like or want.

Information provided from the neuromarketing techniques about the emotional processes at the base of the decision making could also be used by governmental agencies to promote actions and communications to better educate citizens toward decisions for their own benefit. Such possibility, known as "libertarian paternalism," could be implemented by governments in order to nudge behavior and subsequently alter economic preferences and the related real-world choices (Thaler and Sunstein 2003, 2009; Levallois et al. 2012). Technically, the "nudge" is defined as any aspects of the choice architecture that could change the people's behavior in certain determined way. However, such nudging at the same time does not exclude the possibility for the people to act differently from what is suggested (Thaler and Sunstein 2009). In this context, the word "choice architecture" is related to the environment that frames an individual's choice. The perspective from the point of view of this "nudging" will be that neuromarketing-based information gathered on consumers could generate a powerful leverage for improving healthy behavior, as for instance that related to the suppression of bad habits such as heavy smoking, heavy drinking, and unhealthy eating (Fleischhut 2011). As an example, a recent research project supported by the European Union under the Horizon 2020 funding program, the *SmokeFreeBrain* project, aimed to gather cerebral reaction from smokers in front of antismoking public service announcements. The final aim of such particular aspect of the project is to better understand the "ingredients" to be employed for a more efficient communication against smoke to be used in EU-funded campaigns. Another important aspect of nonprofit use of neuroscience-based

techniques to gather information about the overt decision making of humans is related to a better understanding of their ethical decision (Bazerman and Tenbrunsel 2011; Singer 2015).

However, the possibilities of the application of the neuroscience to better understand the human preferences and to gently push in some direction their (un)conscious behavior toward some (supposed good) choices have raised some concerns in the society. An old saying stated "the road for the hell is paved with good intentions," and there is currently a debate about the legitimacy of such nudging possibilities (Blakeslee 2004). In fact, there are questions related to the fact that libertarian paternalism and the related nudging also supported by neuromarketing measurements could not be consistent with a concept of democracy, in which people would like to be in the condition to choose freely what they want. It must be underlined that in the general debate the concept of the "cognitive liberty" is used to defend the rights to have information privacy (Sententia 2004), linked to the fundamental rights of the individual (Bublitz 2014). These questions are not simply "academic" since several national governments attempted to implement different forms of nudging, such as the Behavioral Insight Team in the UK (http://www.behaviouralinsights.co.uk), the "Mind Lab" in Denmark (http://mind-lab.dk/en/), or the "Neuroscience in public prevention" initiative generated in 2010 by the Center for Strategic Analysis of the French Prime Minister.

6.1.2 (Mis)perception of the Potentialities of the Neuromarketing

It is out of doubt that the application of neuroscience to the marketing has generated a lot of debate in the academic and in the public opinion, partly fueled by fears based on misunderstandings of the actual possibilities of the proposed technologies. In fact, warnings about a new form of subliminal persuasion supported by the neuroscience toward the consumers have been issued recently (Oullier 2012; Chester 2012). The current public fear is that the availability of neuroscience-informed methodologies could be used to support and promote the consumption of unnecessary and unhealthy goods and foods.

Furthermore, issues arose related to the undermining of social values through the implicit and explicit association of brands with values in advertising, as well as with the manipulation of consumers and the infringement of personal autonomy (Spence 2013; Spence and Van Heekeren 2005). Other fears perceived and reported were that better shaped advertisings through neuromarketing techniques could target more efficiently some vulnerable populations such as children or elderly, by using some form of unconscious emotional influence. These fears exist in the public although overall in marketing ethics it is morally forbidden to market goods to particular populations in ways that take advantage of their vulnerability (Brenkert 1998; Klein 2007).

It must be stated that some of the fears attributed by the public opinion to the use of neuromarketing techniques have been already addressed years ago by the legislation in other field of study. However, the lack of a right and proper communication between scientists, neuromarketers, and the public opinion in this area makes such fears still perceivable as actual. A possible example of this misperception is the argument that with the neuromarketing techniques it could be possible to steal hidden political, economic, or other sensitive orientation of persons during an electroencephalographic data collection related to the evaluation of a commercial advertising. This acquisition of such person's orientation would happen without they being aware of that. This fear is based on the neuroscience evidence that our brain always generates an immediate response in the case of appreciation or rejection to an incoming stimulus (Davidson 2004). Such response is easily recorded by using electroencephalogram (Babiloni et al. 2000, 2001, 2004; Mattia et al. 2003) and could be used to judge our agreement or not with the image or with the video proposed. For instance, if in the middle of a commercial break an image of a political group is inserted, it is possible to collect and evaluate the cerebral reaction of the tester to such political image. The tester in this respect cannot mask his/her reaction to such image. Thus, the fear is that information on this particular "sensible" preference could be fraudulently extracted from him/her without an explicit consensus. Clearly, this fear is not specific to the use of neuromarketing research in practice. In fact, such fear about the "stealing" of private, sensible information without our consensus could be applied to many cases in our day life in which we rely on the trust of an explicit or implicit agreement. Let us consider the performance of a normal blood analysis, by counting the number of the red and white blood cells. Ideally, we just deliver our blood sample to a specialized company that some days after will return us the number of red and white cells in our blood sample. However, in principle, the company could extract our DNA from the blood sample, make a complete sequencing of our genes, and sell all the information to our insurance company. Then, the insurance company could fraudulently know if we are genetically sensitive to heart attacks, for instance, and then regulate the insurance prize in agreement with that. However, this behavior is not allowed by the current regulation in all Europe and the USA. In fact, if biological data is used to generate results that are relative to large group of population, legal issues are not relevant. But, as in the above-mentioned case, when such results target individual subjects and take advantage of personal information that is intimate or private in nature, legal problems clearly emerge. The problem has been solved for years with the fact that in the case of the blood sample analysis, we clearly only confer to the blood analysis company the right to count our blood cells. All other actions that the company will perform on our blood sample are in violation of the contract we made with them. These problems have been normatively addressed through national and international legal instruments (Casabona 1999).

Thus, the same concepts and the relative regulation are applicable also in the neuromarketing context, in which transparent manner requires the subjects to give with their informed consent signature the rights to share their cerebral and emotional

activity related to the evaluation in average of a marketing communication or product only. All other actions related to the sharing of these biometric data are violating the signed contract and then are outlaw. These actions include also the dual use of the data collected for a specific client. From all above, it could be appreciated as several concerns related to the application of neuroscience to the market research are present at different levels of the civil societies, in both stakeholders and shareholders. It is exactly at this point that the issue of the transparency and reliability of the neuromarketing activities needs to be raised up.

6.1.3 To Increase the Transparency and Reliability of Neuroscience-Based Methodologies Offered by the Neuromarketing Companies

Transparency about what is possible and what is not possible to obtain with the neuromarketing methodologies needs to be (better) communicated toward general public and industries by the professional companies that furnish such services. In fact, as it was easily noted from the previous section, the expectations (and the relative fears) from the civil society about the efficiency of the neuroscience-based techniques are usually overestimated.

Unfortunately, different professional companies that operate in the field of neuromarketing have interest to underline more the strengths of their claims than the obvious limitations that the neuromarketing techniques currently have, as any other applied research methodologies. This lack of transparency about the limitations of the neuromarketing techniques to be used in market research obviously does not mitigate in the public the overestimation of its possibilities.

We think that there are several actions that could be performed to increase the transparency and the reliability of the neuromarketing services offered to the corporations as well as the correctness of the perception by the public opinion on such methodologies.

In fact, the companies providing neuromarketing services to the industries must state clearly what kind of neuroscience-based methodologies they are currently employing. Such companies should provide to the interested industries the scientific references of the methodologies employed, based on published scientific literature freely available to everybody. Very often, neuromarketing companies propose to industries services based on their "black-box" methodologies, i.e., protected by secrets that "have been proved works so good in many research occasions." In this way, it is impossible to judge for the industries the quality and the validity of the particular approach proposed, beyond the words of the proposers. A consequence of this practice is that the claims of the neuromarketing companies cannot be checked seriously from a third party, since the science behind such approach is not revealed overtly. Such dearth of transparency in the neuromarketing methodologies adopted generates a lot of misperception in all the receivers of these services, as well as in the public opinion.

In order to contrast this situation, a good move was made by the Neuromarketing Science and Business Association (NMSBA) generating a code for the ethics in neuromarketing research that suggests to the neuromarketing companies a series of good practices. One of such practices is to share with the shareholders (e.g., the market research company or the final client) facilitating methodologies to be employed. This suggestion is obviously along the line of making easier the comprehension of the methodological black box often advocated in this context. However, although this is a good step in the right direction it is still not enough. In fact, the major misperception of the potentialities of the neuromarketing comes from the public opinion that have no other sources of information about the limitation of the neuromarketing technologies than those provided by the same companies and from the scientists of the academia. Thus, the final correct step to remove such misperception is to make clear the scientific basis of the methodologies employed, publish such references on the websites of the neuromarketing companies with clear description also of the results provided, and clearly explain that the identification of any "buy button" is impossible at all. If such information would be available, the civil and academic society could independently judge the limitations and the advantages of the neuromarketing techniques by themselves. Furthermore in the consent provided to the subjects involved in a neuromarketing test, a notification has to be included of the possibility for each experimental subject to know the main goals of the study after the experiment and eventually to refuse the elaboration of his/her own data if not in agreement, without any consequence at all.

Of course, the same transparency actions would equally be applied in the neuromarketing companies as well as in the standard marketing research agencies: the confidentiality of the information gathered, non-reusability without any explicit permission of the owner of the study, and other standard good practice in the field. These ethical measures are not in discussion here since they belong to the standard practice of a larger field of the market research.

The convenience of adopting such measures with adequate transparency and information generally in marketing as well as in neuromarketing research is also suggested as repair because of the low level of credibility that the field has in the public opinion. Fig. 6.1 presents the opinion of the public about the reputation of several professional categories in the USA, as taken from a survey in December 2014 in the USA, by a Gallup research. These results are based on telephone interviews conducted on December 8–11, 2014, with a random sample of 805 adults, aged 18 and older, living in all 50 US states and the District of Columbia. For results based on the total sample of national adults, the margin of sampling error is ±4 percentage points at the 95 % confidence level. It can be clearly seen that the level of the reputation of the advertising practitioners is rather low in the public opinion. Thus, the advertising practitioners must take care seriously of the debate on the intrinsic "honesty" of the neuroscience-based approaches as well as of the marketing practice as a whole. Thinking that neuroscience in marketing could add further damage to the category reputation may not be a correctly addressed warning.

Fig. 6.1 The picture presents the level of the reputation of several professional categories as emerged from a professional survey conducted in 2014 in the USA. The data relative to the marketing practitioners is circled in *black*

6.1.4 To Increase the Transparency and Reliability of Communication About Neuromarketing Methodologies

Several actions could be performed by the different actors involved in the neuromarketing applications to promote a better perception of what is actually possible and what is not in the neuromarketing field. With the word "actors" we would like to indicate those subjects that are in the privileged position to generate a proper information about the neuromarketing issues toward different targets of the civil society. These actors are scientists, neuromarketers, practitioners, shareholders of the neuromarketing services (e.g., market research companies, communication agencies, specialized companies), as well as journalists.

In particular, it should be a duty of the scientists that are performing scientific research in the neuromarketing field or related areas (economy, engineering) to explain clearly in their communications what are both the current limitations and the strengths of the neuromarketing techniques. These communication actions have to be exerted toward different targets: the same scientific community, the shareholders of such techniques as well as the stakeholders, and the general public. Communication toward the scientific community from the scientists involved in the neuromarketing field has the aim to increase the awareness related to research about the capabilities and the limitations of the current available methodologies when applied to marketing relevant stimuli in order to better understand their effects and consumer's behavior. Otherwise the communication toward the

Table 6.1 Communication actions useful to increase the transparency related to the use of the neuromarketing instruments

Communication from the specific actor	To academia	To shareholder	To stakeholder	To general public
Scientific academia	(a) Scientific papers toward scientific international journals	Translational workshops	Conferences, press releases, interviews toward the media	(a) Divulgation books
	(b) Scientific books			(b) Dedicated public presentations
	(c) Presentation of neuromarketing methodologies to interdisciplinary conferences and workshops			
Neuromarketing companies	Translational workshops	(a) Private interviews	(a) Public interviews on mass media	(a) Participation in public debates
		(b) Demonstrations	(b) Website	
		(c) Presentations	(c) Facebook	
		(d) Fairs	(d) Twitter	

shareholders from the scientists has the duty to underline the state of the art of scientific research and then to clearly mark the promises that could be kept and those that cannot for such research application. Other targets of a correct scientific communication by researchers will also be the stakeholders (nongovernmental organizations, consumer associations, etc.) and the general public opinion.

However, the scientists are not the only figures having the duty to improve the awareness and the knowledge of the different parts of the society toward the real possibilities of the neuromarketing approach in increasing the powerfulness of marketing research. The neuromarketing agencies have the duty to inform shareholders and stakeholders interested in, through a clear reporting, about their science-based technologies on the website of their own companies (Table 6.1).

Communication toward the general public, interested industries, and also stakeholders (e.g., consumers' associations, governmental agencies for the promotion of healthy lifestyle) must be promoted by the scientists involved in the field, as well as by the world association of neuromarketing (NMSBA) to diffuse a better knowledge about several issues. Some of them are listed below:

(a) What kind of information related to the marketing field can be revealed by neuroscience today?
(b) What is the nature of this information and what are their possible interpretations?

(c) What neuromarketing methodologies are available to partially decode consumers' decision-making processes? Moreover, a clear involvement of the shareholders (e.g., industries, marketing research institutes) giving effort in this communication campaign is important to support a better transparency of the above-mentioned concepts.

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Chapter 7
Implicit Measures of Attitudes in Market Research

Michał Matukin and Rafał Ohme

7.1 Theoretical Background

Marketers/advertisers have always been interested in finding ways to predict consumers' behavior. Attitudes were the most obvious way to pursue the Holy Grail. Researchers tried to explore the correlation between declared attitudes of respondents and their actual behavior for years.

The most popular tool in survey research to measure respondents' attitudes and opinions was (and probably still is) the Likert scale invented by Rensis Likert in 1932 (Bohner and Wanke 2002). The Likert's scale usually consists of 5 or 7 points with 0 in the middle—each point describes the point on some continuum, e.g., from definitely disagree to definitely agree. In this case the participant of an experiment indicates to which extent he/she agrees or disagrees with the sentence describing the attitude. Presented sentences can describe characteristics of behavior towards the object of the attitude together with effective reactions to the object, e.g., I would buy "this product." The final result of such research is based on the average ratios of indications for each sentence describing the attitude.

One of the strengths of Likert's scale is that it allows us to compare the scores because it enables us to put each score on a range scale (1–5 or 1–7) with regard to certain aspects of the attitude. The range of the scale differs depending on the examined attitude (Likert 1932). Since pilot studies and earlier research show that there is a big variance of opinions on the object, it is better to use Likert's scale which will show differences between the examined persons in a more detailed way. Due to the

M. Matukin (✉)
NEUROHM, Warszawa, Poland
e-mail: michal.matukin@neurohm.com

R. Ohme
University of Social Sciences and Humanities, Warszawa, Poland
e-mail: rafal@neurohm.com

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"0" in the middle of the scale it is possible to describe not only positive or negative attitude but also neutral valence, as well as its strength. The construction of the scale is made in the way that each position describing the attitude represents an unambiguous opinion on the object, so it has high intercoherence (Bohner and Wanke 2002). The Likert's scale can be used to assess the consumers' opinions and draw conclusions about their attitude and desires that are connected with purchase behavior. Nevertheless, all in all the Likert's scale is based on our rational and declarative opinions which makes it prone to some distortions.

Due to people's tendency for cognitive consistency (Abelson 1968), declarative data sometimes may not reflect ambiguous opinions or subtler differences in attitudes. Trying to establish the correlation between attitudes and actions, Krauss managed to perform a meta-analysis of 85 publications, which proved that the correlation between subjects' evaluation and behavior is not very high (0.38) (Krauss 1995). Therefore, it seems to be beneficial to introduce entirely new methods that allow us to be more precise or enhance the Likert scale with innovative approaches that will allow us to achieve more reliable results. This seems to be especially appealing in terms of applying these tools into advertising or market research—as this is the field that yields well for high consistency between attitudes and decisions, choices or behavior.

7.1.1 Reaction Time and Attitudes Accessibility

It is crucial to remember that the explicit attitude measured by the questionnaires is based on processed information, complying with the social approval of a given attitude or behavior, and based upon "cost-benefit analysis" (Dovidio and Fazio 1992). The same goes for the perception of advertisement and brand memory. Concluding from abovementioned research, it is necessary to be careful while predicting future behavior upon self-made reports and explicit measures.

The researchers have been exploring various methodologies that aim to strengthen the effectiveness of Likert's scale in order to predict respondents' behavior, choices, or decisions. Among other traditional and generally popular survey research the Reaction Time (RT) method was developed. At the beginning it was applied in the form of the Implicit Association Test to verify implicit attitudes primarily in the field of ethnic and gender stereotypes (Greenwald et al. 1998; Bargh 1997; Greenwald and Banaji 1995) but it was quickly adapted to other fields as well (memory, perception, self-esteem, etc.). Reaction Time is one of the methods which allows us to go beyond declarations and reach deeply into people's hidden motivation. In this light, the strength of the method using Reaction Time is that it enables us to test attitudes that are activated instantly, often without conscious awareness (Bargh 1997; Johnson and Weisz 1994; Greenwald and Banaji 1995).

Russel Fazio, Professor of Social Psychology at Ohio State University, defines attitude as evaluation of a given concept that was learned in the process of experience and learning. Attitude aspects like strength and accessibility might vary and depend on many factors. To measure attitudes' strength and accessibility Fazio and his col-

leagues have been using a Reaction Time paradigm. The stronger attitudes (and thus those that usually are more accessible) are expressed with higher confidence; therefore the reaction time with which they are expressed is quicker. Fazio (1986) discovered the link between behavior and attitude—the real behavior will be more likely to occur if the declared attitude connected with this behavior is expressed rapidly (the attitude is highly accessible and/or strong). In 1984 before the US Presidential elections Fazio and Williams (1986) tested the accessibility of the opinions about candidates. On the day after the elections they contacted the respondents again to see what the real outcome was and how the respondents had voted. It occurred that the much stronger link between the declarations and the real choice was among voters who had strong attitudes in the first measurement (they answered with a fast reaction time) in comparison to those with weaker attitudes (80 % vs. 44 % of explained variance when explaining the real votes). Fazio and Williams when explaining the reasons behind this effect suggest that it is the effect of greater attitudinal stability among people with stronger attitudes. We can infer from this that the stronger the attitude, the more stable it is. The question about ethical aspects of the answers provided by the respondents arises. Is it possible that respondents lied or mislead the researchers? Does it mean that respondents who said one thing and then did another did it on purpose? Apparently this is not the case, as the results suggest that weak attitudes are not as strongly connected with conscious processing of information (Fazio 1989; Roskos-Ewoldsen and Fazio 1992) and in effect they just have a weaker influence on behavior. In cases where the accessibility is low, it means that the attitude is not strong enough or it is not fixed yet. In other words, even if respondents declared something else, they did not incorporate it on an emotional level. Asking a question "forces" people to make a choice and select an answer on the scale—thus the respondents had to provide an opinion even if they were not sure. If the answer is provided with low certainty (low strength/accessibility), it means that the answer is more a guess or a wishful thinking. It doesn't necessarily mean it is not true but the probability of such an outcome is increased. It does not mean that the respondents were lying, so from an ethical stand point the situation is clear. However, if the researchers need to make conclusions on such declaration-only based results, ethical (research) conduct should suggest that the results should be validated via another approach if there is a risk that respondents were guessing or disclosing opinions or attitudes that are not fixed yet. We can face a similar situation regarding sustainability. Attitudes that are strong and more accessible are more difficult to change (Wu and Shaffer 1987) and thus are able to drive behavior in a stable manner. Consumers are more certain about strong attitudes but they do not necessarily have to be aware of the link between this particular attitude and their behavior. However, such knowledge enables us to discover those attitudes or even elements of attitudes that are strongly linked with behavior even if the respondents are not fully aware of this relationship. The Reaction Time measurement can be very useful here. It is possible that these are the reasons why Fazio's (1986) model explaining how attitudes can guide behavior is currently receiving a fair amount of interest and attention. Such an approach allows us to better fulfill the ethical conduct and research ethos to increase reliability and validity of market research tools.

7.1.2 Attitudes and Behavior

Our conclusions drawn from the above are that to guide behavior, attitudes must be strong and accessible. Attitudes that are expressed with high certainty are decoded from the memory faster and have greater potential to guide behavior. Attitudes can be activated easily and spontaneously, simply by the presentation of the question related to the attitude (Fazio et al. 1986) and they do not require awareness or evaluation processes. In the light of Fazio's work, attitudes are much more emotional in nature and conscious consideration doesn't necessarily have to be involved. However, it is not the case that thanks to measuring accessibility we will be able to infer about the attitudes that respondents do not wish to reveal. Measurement of accessibility allows us to discover whether the respondent is certain about the attitude and whether the attitude has the potential to drive him to action. If respondents want to hide something, the measurement of strength of this attitude will show that this attitude is not fixed and suggests that maybe there is a need to explore this area further; however this won't work as a lie detector. In that sense the reaction time measurements do not violate any rights of respondents (e.g., right to refuse the answer) and are ethically perfectly in line with well-established market research or even academic research practices. At the same time, they allow us to maintain high reliability of the results minimizing the influence of uncertain or not fixed opinions and allowing us to identify the most important (certain) of these attitudes. Again this approach serves well to maintain research ethos and to increase reliability and validity of market research as most consumers' choices derive from unconsciouss processess (Zaltman 2003) and can be captured only by suitable tools.

Most criticism of the described model is focused on indicating that the strength of the attitude is rather connected with norms and language than with learned attitudes (Bargh et al. 1992). There is a possibility that norms and language can be moderators of Fazio's findings, so they are not negating this theory but they are rather providing an additional point of view. Especially that many researchers all around the world replicated Fazio's reaction time findings and proved that attitudes strongly accessible from memory make guiding corresponding behavior more likely (Ajzen 1982).

7.2 Science in order to Help Societies

7.2.1 High Technologies to Serve and Protect

Many researches are conducted in order to test socially sensitive issues such as racism, violence, or health issues. In many of such cases these researches are biased by the social norms and the results we gather can be distorted due to various factors (e.g., political correctness, conformism). The Neuromarketing ethos can be

valuable here as it allows us to gather results in a more objective manner and thus increase reliability and validity of such research. On the canvas of this, we believe that reaction time methodology can be implemented to support noble ideas and thus benefit people everywhere by helping to identify attitude–behavior drivers related to socially sensitive issues.

7.2.2 Neuro Against Smoking Project

All around the world health warning messages (WMs) have been introduced to build up and increase the awareness of the harmful effects of smoking. Such warnings presented on cigarette packages can result in high frequency of exposure of the messages at the point-of-sale or prior to product use, and this exposure potentially may affect both health beliefs and smoking-related behavior (Hammond 2003). There have been concerns that the existing text-based warnings are less effective than the pictorial warnings (Dumas 1990; Hammond et al. 2006; Borland et al. 2009; Vardavas et al. 2009).

In 2014, together with Neuromarketing Science & Business Association (NMSBA) we decided to conduct the Neuro Against Smoking (NAS) project—to our best knowledge, the first study in the world regarding tobacco health warnings conducted on such a broad scale. This pro bono study was held in 24 countries, spanning 6 continents and was a great example of how Neuromarketing techniques can be used for the greater good.

The NAS Project was aimed at promoting a healthy lifestyle, supporting the tobacco-free environment and thus aiding societies and governments in their fight against smoking. Specifically, it brought valuable new insights to the existing discussion on cigarettes warnings. By integrating explicit declarative measures together with implicit reaction time based analysis, the study explored the influence of tested warnings on smokers' attitudes.

Between 80,000 and 100,000 adolescents worldwide start smoking every day with 69 % of current smokers being unable to quit despite the fact they want to do so (Centers for Disease Control and Prevention 2011). Yet smoking is described as a pediatric disease as more than 88 % of current adult smokers began their habit before 18 years of age (National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health 2012). Knowing that, our study targeted young people during their first 3 years of legal age of purchasing cigarettes in a given country.

We believed that from an ethical standpoint the antitobacco communication is a life saver and if there is something that can be done to support this initiative it should be done. Using neuromarketing tools to assess the attitudes of smokers and see how they are linked to real behavior is not only interesting from a research point of view but also it can bring new insights to existing knowledge and thus support this noble cause by providing more reliable and meaningful data.

Fig. 7.1 Warnings messages used in the Neuro Against Smoking (NAS) Project: according to WHO recommendations, the warning covered 30 % of the package in minimum

7.2.2.1 Methodology

The test was held in 24 countries[1] in the form of an online survey enhanced with Reaction Time measurement. Respondents were presented with various warning messages (see Fig. 7.1) accompanied with a given statement and asked to rate on a 3 points scale (yes, hard to tell, no) whether they agree or disagree that the statement accurately describes the displayed warning messages. Both indicators, declarations and response time of the answers, were measured. We asked the respondents whether the warning, encouraging quitting smoking, is trustworthy, evokes positive emotions, and evokes guilt. Moreover, we asked if a given warning message can influence attitudes toward smoking: smoking damages smokers' health, smoking harms other people, smoking is addictive.

Over the course of the study we tested how different warning messages were perceived regarding: (1) type of message—text only/text + picture (Lalla Ilhame et al. 2009; Lin et al. 2011); (2) social perspective—self only oriented/self + others oriented (Agrawal et al. 2007; Duhachek et al. 2012), as they are indicated as important factors of warnings effectiveness. When designing the research, we thoroughly took under consideration the World Health Organization's recommendations stating that warnings should cover a minimum of 30 % of the package, they can consist either of text only or text + picture, and they can present a variety of content—oriented on smokers or smokers and people around them. Being aware that all of the countries participating in the study followed different regulations concerning cigarette packaging, we wanted to see what effect it would have if they were following the minimum requirements of the World Health Organization. Taking those aspects into consideration, we have selected four different warning messages for testing:

[1] Countries participating in the NAS Project: Argentina, Australia, Brazil, Chile, Colombia, Ecuador, Finland, France, Germany, Guatemala, India, Japan, Republic of Korea, the Netherlands, Panama, Poland, Romania, The Republic of South Africa, Switzerland (DE + FR), Taiwan, Turkey, UAE, the UK, and the USA.

1. Text only based self-oriented message (smoking kills)
2. Text + picture based self-oriented message (smoking kills + picture of a dead body)
3. Text only based self and other oriented message (smoking harms you and others)
4. Text + picture based self and other oriented message (smoking harms you and others + picture of women and child in a cloud of smoke)

In order to make sure that we have kept the highest parameters and quality of gathered reactions time data, we have applied dedicated software and subjected the respondents to individual calibration consisting of scale learning task (how to use a scale) and reading time measurement (how long it takes to read words of different length). It was done to create a personal baseline and minimize the influence of various factors such as individual differences in the speed of the nervous system, familiarity with computers (age impact), fatigue (first vs. last minutes of a session), length of statements (short vs. long), the speed and stability of internet connection, and/or (in)voluntary carelessness of respondents.

7.2.2.2 Findings

Averaged results gathered from 24 countries proved that pictorial messages are more effective than text only based warnings. Even if textual warnings were evaluated equally high in declarations as pictorial warnings, on an emotional level warnings containing pictures were more convincing, as revealed by *Reaction Time* measure. Therefore, we were able to discover that pictorial warnings create stronger attitudes and thus have better chances to drive behavior.

Moreover, it seems that warning messages emphasizing harm done to other people are more effective than messages emphasizing harm done to smokers' health. It seems that messages where the focus is put on the other people create stronger and more accessible attitudes. It might suggest that attitudes concerning other people are more accessible and more easily triggered than attitudes concerning only smokers.

Additionally, both of the findings seem to be strong and culturally independent as similar findings were discovered in most of the participating countries.

These findings show that there is high potential in surveys utilizing Reaction Time to test socially sensitive issues.

7.2.3 The Additional Value of Implicit

Reaction Time measurement allows us to enrich the insights derived from declarative answers in order to improve the effectiveness of warning messages. By combining the declarative research method with reaction time measurement the study came with two findings which showed that using neuromarketing tools strengthened the result of traditional research and might be beneficial in bringing more value to the most important social issues.

The NAS Project showed that the data gathered solely by explicit declarative methods provide clear insights in only 50% of tested cases. Whereas enrichment with a reaction time approach increased this score significantly: over 25% of additional insights can be derived thanks to a combination of explicit and implicit methods and therefore more findings can be identified. It proves that the application of Neuromarketing tools is beneficial when looking for the most effective solution. This approach also proved to be successful across different countries as it was able to reduce the influence of cultural biases and the ceiling effect that might have occurred due to cultural differences. Current study outcome supports actions initiated by WHO—e.g., introducing pictorial warnings in new countries (e.g., the UK, Poland). However, it also indicates that such pictorial messages should be selected carefully to maximize their effectiveness.

The next steps should be to measure the attitude–behavior relation and which aspects of the attitude have a crucial impact and are able to drive desired behavior. If this can be identified and we believe that with a reaction time approach it is possible, then we will be able to find the cues that should be emphasized and used in communication to effectively promote nonsmoking behavior.

The application of combined explicit and implicit measures is not limited to health issues and can be very useful in other areas such as marketing/sales/human resources, where attitude–behavior relations matter.

7.3 Summary

We hope and believe that neuro methods can be used for the greater good, bringing more objective results they can support governments in their fight against issues like smoking, obesity, AIDS/HIV, and many others. We live in an era of fast development and constant improvements in many aspects of our lives. Globalization and new technologies bring new challenges, but also new opportunities. We believe that which was proposed by the Russell Fazio model, in which the attitude can be explained by two factors: (1) declared opinion (measured, e.g., with surveys) and (2) accessibility, thus the strength of the attitude (measured with reaction time that reflects respondents' confidence) allows us to increase the reliability of traditional research methods. Applying these theories in practice we can enhance the accuracy of predictions in comparison to results based solely on declarations. We believe that such a work ethos, based on a two-factor model of attitude or in general on Neuromarketing discoveries, will become a daily practice in research. This will have a positive impact not only on the Neuromarketing field, but also on surveys in general and if it will be applied in other sensitive issues it will have a positive impact onto societies. It is a matter of how we use our tools that bothers the audience that is not familiar with Neuromarketing. We should show them how much good those tools can provide while at the same time fulfilling the work ethos to the core by providing the best in class tools methods and procedures that are based on scientific theories.

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Chapter 8
Ethical Considerations regarding Stakeholders in Neuromarketing Research. Empirical Insights from NMSBA Corporate Members, TAAN Advertising Agencies and Romanian Companies

Nicolae Al. Pop, Dan-Cristian Dabija, and Ana Maria Iorga

8.1 Introduction

Found in a permanent confrontation with the great changes of the contemporary world, as well as the effects of the "digital revolution," globalization or hyper competition, the theory and practice of marketing have been going through a dynamic upsurge. Without forgetting about its core essence regarding the added value it should offer to each of its stakeholders, whether they are consumers, customers, partners, or society as a whole, through all its activities, institutions, processes (AMA Definition of Marketing, 2013), contemporary marketing is faced with a number of dilemmas, which put into question its reformation. Scientific literature has recently concluded that this concept has to "modernize" and that this change has to occur urgently (Sheth and Sisodia 2006). In this manner, the field should regain some of its lost virtues (trust, honesty, integrity, mutual empathy in the relationship with the customer, honest dialog, humanity, insight, etc.), with the help of which a marketing specialist's activities and involvement can reach more ethical grounds. The marketer is requested more intensely to establish and strengthen the place, position, and importance of marketing within an organization, be it (Verhoef and

N.A. Pop (✉)
Bucharest University of Economic Studies, Bucharest, Romania
e-mail: nicolae_al_pop@yahoo.com

D.-C. Dabija, PhD, Dr. habil.
Babeş-Bolyai University, Cluj-Napoca, Romania
e-mail: cristian.dabija@econ.ubbcluj.ro; dabijadancristian@gmail.com

A.M. Iorga
Bucharest University of Economic Studies, Bucharest, Romania

Buyer Brain, Bucharest, Romania
e-mail: ana@buyerbrain.com

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Leeflang 2009) a corporation, or a small to medium business. Since the beginning of the twenty-first century, more and more research (Malter et al. 2005; Nath and Mahajan 2008) has shown the weakening performance of marketing related activities within the organization, pointing out that, especially in the context of large corporations, the position of financial departments became much stronger than that of marketing divisions. Moreover, marketing problems are being given less attention and time during a company's Board of Directors meeting.

The present study aims at identifying and clarifying the attitude towards the ethical issues arising from neuromarketing studies, as extracted from three different categories of stakeholders who are connected with this field. Therefore, we will take into consideration companies that perform this type of research (neuromarketing companies), companies that benefit from the use of such studies when creating their promotional output (advertising agencies), and direct beneficiaries of different countries. Considering that we have three perspectives on the same neuromarketing ethics debate, the present chapter has aimed at finding similarities and differences between them, specific to each stakeholder category. The authors, in their documentation, have not yet dealt with or read about a similar approach.

8.2 A Company's Market Success and the Marketing Mindset

In order to reconfirm marketing's integrating function in an organization, as it has been established in the scientific literature (Weis 2015; Homburg and Krohmer 2009), we are required to create a much clearer demarcation of the responsibilities, duties, and functions that a marketer must comply within the company. The success of this approach rests upon the most important characteristics that a marketer should emphasize, for example (Schebesch and Pop 2013; Pop et al. 2015):

(a) Empathetic thinking and action, capable of steering his/her marketing decisions towards the needs, desires and preferences of actual consumers/users/target groups
(b) Rational creativity when conducting research-development-innovation activities that are performance oriented (material goods, services, ideas, experiences, rights) and that successfully respond to market demands, while also considering resource preservation and societal development based on sustainable principles
(c) Partnership spirit associated with all the marketing actions that are carried out, both internally, when collaborating with other departments of the company, and especially externally, in relations with all stakeholders involved in the business, out of whom, first and foremost, consumers particularly stand out

Transposing such personality characteristics of marketers into everyday organization activities demands a mutual responsible collaboration between practitioners and theorists. It requires promotion of strategic marketing thinking and actions,

developed for medium-term and long-term periods for all departments of the company. Therefore, it is also necessary to change the mentality regarding the significance of enterprise-level marketing activity. Disseminating marketing mentalities in all functional and technical compartments of a company is an idea that has been promoted starting with the last decades of the twentieth century by the Romanian School of Marketing, which was initiated and led by Professor C. Florescu (Florescu 1987; Pop 2011). The support for this evolution path is based on the idea that marketing theory has crystallized as "… open-minded, dynamic, of structural-organizational nature" (Florescu 1997).

The marketing mindset implies that the specific vision for this approach will permeate all other company departments without disrupting any specific activity, but will support, blend, and integrate them in a harmonious manner, having as ultimate objective the fulfillment of the organization's targets (increase market share, get new customers or create loyalty among existing ones, augment ROI and turnover, increase the company, etc.). Thus, for example, the Head of Human Resources could guide activities that imply selection, motivation and coordination of the staff, according to specific rules, but keeping in mind that each employee should be placed in a position from which he or she is more likely to contribute to the organization's overall maximization of results, on the market that it serves. Similarly, the Head of Finance and Accounting department would consider development associated costs as an investment and not just as expenditure. Such an investment can be used for organizing an event on behalf of the company, that could aim at increasing corporate and/or public awareness, presenting new company benefits and brands, approaching better targeted groups and so on.

In order to implement an approach focused on marketing see as an integrative vector and coordinator of all company activities, the marketer will need to highlight three additional attributes, namely honesty, responsibility and respect for customers. Also in relation to all other stakeholders, the marketer will need to clarify the ethical and transparent implementation of strategies and/or tactics on behalf of the organization that he/she represents before all the context given market players. The marketer's responsibility for an ethical conduct is also defined in the code of ethics of the American Marketing Association (AMA Ethics Code 2016).

An experienced marketing specialist acting in accordance with the principles of business ethics should continuously reinforce a transparent, original, innovative, creative, and analytic thinking, especially in relation to the consumer, whose preferences, motivations, and attitudes are in constant evolution, and whose buying behavior reflects a high prevalence towards multiple preferences, that change rapidly in time. Basically, the marketer must become a "genius" (Fisk 2007) of the relationship company—stakeholders (customers, competitors, suppliers, distributors, etc.). Only a pragmatic, holistic, intuitive, and multidimensional type of thinking will allow the marketer to find the best solutions to the needs and/or desires expressed by his customers, regardless of their nature: individual versus organizational. During the purchase decision (acquisition), when using, consuming, expressing preference for certain benefits (goods, service, trademark, company), the individual is found at the confluence of congruent action, and sometimes antagonistic to his/her senses

Table 8.1 The evolution of thought and practice of marketing from 1996 to 2015

Timeline	Main topics	Prevalent metaphor	Generating factors
1996–2004	Studies on customer profitability and resource allocation efforts	Marketing as a limited resource	– Developments of database technology
			– Ability to obtain individual data relating to clients
			– Analysis at the individual level (client, etc.)
2005–2012	Marketing accountability and focus on clients	Marketing as an investment	– Technological developments
			– Deep understanding of customers in order to support marketing initiatives
			– Investment activities in customer oriented marketing
2013–today	Marketing—the central factor in the context of current media development	Marketing as an integral part of the organization	– Changes in the use of various types of media, especially social networks
			– Focus on marketing efficiency and effectiveness
			– Firm values generated through company stakeholders' involvement

Source: Kumar (2015)

(which they only partially control) in relation to experience, to their temperament and intelligence (Foscht and Swoboda 2011), all engaged in an individualized network (Seidel 2008) that is relatively difficult to adequately understand and/or to detect. This situation generates complex challenges for the marketer, facing him/her with a number of difficult decisions that need to be taken. Given this context, these decisions should be based on the marketer's intuition and experience gained from similar market circumstances and on their cognitive, emotional, and rational predictions (Brătianu 2015) with respect to a specific market environment, but also on social intelligence, and innovative and critical thinking, thus avoiding any unfavorable situations for the company that he/she represents.

8.3 From Stakeholders' Management to Holistic Marketing

The evolution of marketing thinking and practice has been the subject of many studies and/or research that unanimously emphasized the dynamism of this field and the fact that it continues to extend its applicability to contemporary social and economic life. The systematic research of Keríno (1996) and Kumar (2015) offers an evolutionist perspective on marketing thought and practice. Table 8.1 shows the chronology and the main themes that marketing focused on during the past two decades, scoring the key generating factors of theoretical research, respectively of practical research.

During the past two decades, marketing's evolution has been supported by the development of marketers' strategic thinking, in conjunction with a holistic approach of the interaction between the business and its stakeholders. At the same time, this type of thinking has encouraged the development of a medium- and long-term perspective on the organization's market relations, ensuring an ethical management of sustainable marketing (Pop et al. 2016). The holistic marketing model proposed by Kotler et al. (2002) requires a full understanding of the connections and interactions between three antagonistic dimensions, that at the same time complement each other: the customer's cognitive space, the company's ability to always provide added value as a result of permanent innovation, and the partnership resources space which arises from the existence of relations with other stakeholders. Any company aiming to enhance performance has to differentiate itself from its competitors through added value for its output, but also through efforts to maintain, satisfy, and loyalize customers. In this respect, marketers have a complex role, focused on three main vectors:

(a) To identify new benefits in clients' cognitive space
(b) To find new essential abilities related to the company's activity field
(c) To select the most suitable business partners from its network of stakeholders

Today's marketing is becoming an integral part of the modern organization, and when it comes to addressing an individual, it resorts more frequently than before to social networks. Approaching market relation in a holistic manner gives marketing new meanings, managing to harmoniously combine momentary interests of the organization with those looking at long-term goals, with its responsibilities of capitalizing on increasingly scarce resources and those within the communities in which it operates (through purchases of resources and/or raw materials, through processing and/or manufacturing units, through stores and/or other forms of distribution). Such openness creates the prerequisites for a sustainable marketing, in which the processes of added value creation, communication, and delivering to the customers take such a form that human capital and natural resources are preserved, and even improved (Martin and Shouten 2012). Thus, marketing is required to adapt its methods, tools, and techniques of communication, research, and/or analysis towards identifying target groups expectations, winning over the sympathy of stakeholders and the markets on which the company is activating, of staff, shareholders, intermediaries, whether suppliers or distributors, of prescribers, etc. (Georges and Badoc 2010). This action cannot take place without the existence of a *global ethical culture* for all actions, strategies, tactics and processes undertaken by the organization, which in time should converge towards defining, tracking, and consistent application of an ethical management that is focused on the principles of sustainable development (Dabija et al. 2016). This management/administration will require the assimilation of habits, customs, social, cultural and life norms, etc. of individuals belonging to different social backgrounds, while they are encouraged to materialize or translate into reality the company's major objectives (Caslione and Thomas 2002; Cheben and Hudackova 2010) in a sustainable framework and respecting a code of ethics in all their actions.

The importance of stakeholders for the contemporary organization is a subject discussed extensively in scientific literature (Freeman 1984, 2010; Freeman et al. 2010), that through the theory of stakeholders' management highlights their role for a company's success on the market. Mitchell et al. (1997) point out the role and importance of stakeholders for an organization, and also the fact that they should be divided according to their legitimacy and power, but particularly depending on their ability to contribute or not to achieving a company's objectives. Rowley, resorting to an analysis of the social networks that we develop and/or somber, develops a theory of stakeholders' influence, grouping them into three categories (Rowley 1997):

(a) Primary stakeholders who demonstrate a higher degree of influence, but low effectiveness (e.g., lenders, insurers, advertising companies);
(b) Secondary stakeholders—characterized by an average influence on the company and relatively low effectiveness (for example, public and regulatory institutions, as the Consumer Protection Office, Competition Council, Workers' Associations, Chamber of Commerce and industry, Trade Register);
(c) Essential stakeholders, whose influence varies, depending on the situation and/or on the market context, from reduced to high, but whose effectiveness is high when conducting business actions for the company (e.g., consignors, suppliers of energy resources).

The importance, and especially the relevance of various groups of stakeholders for a company, differs depending on the nature of their activity carried out on the market, but also on the complexity of economic processes in which they are involved, respectively on the prospects of short term, medium and/or long term business relations. We believe that a company should group together various stakeholders based on certain characteristics. Probably the best way is to differentiate between internal stakeholders who include employees, managers, and shareholders, from external ones gained from clients, suppliers, lenders, insurers, consignors, distributors, public organizations, interest groups, etc. Such a classification allows us to obtain a real balance of somewhat opposing interests, which are emphasized by the distinctive internal and external actors in relation to the company.

The relatively complex management issues of stakeholders has grown even more difficult together with the contemporary openness provided by relational marketing, which, unlike transactional marketing (Kotler 2003), is "… a policy and a set of tools devoted to establishing a number of individual and interactive relations with customers, suppliers and other stakeholders" (Gummesson 2008), which aim to develop a cobweb of networks and multifaceted relations that create a positive and sustainable attitude, favorable for the business. Relational marketing intensely promotes a different paradigm that if implemented, it would entail a consistent and sustainable change that would be directed towards all stakeholders involved in mutual exchange relations. Practically, these do not resume to simply "inciting" the end user to buy the goods, but actually consider him/her a partner of the organization that enjoys full rights. By making use of several instruments/technologies that the company develops and manages for the purpose of understanding, anticipating, adapting to and/or foreseeing the behavior of stakeholders, such as

databases (suppliers, financiers, consignors, intermediaries, insurers, customers, etc.), carrying out studies and specific marketing research in order to make the best decisions, developing internal marketing programs, customer management, solving complaints, etc., a long-term systemic vision is taking shape, one in which all the stakeholders are integrated. Such an approach creates a mechanism able to respond to signals coming from any category of stakeholders, making it possible for the company to reposition itself in the shortest time possible. The philosophy of relational marketing is ultimately based on *winning comparatively competitive advantages*, by implementing specific actions, systemically managed, within the network of stakeholders. At the same time, relational marketing allows and/or facilitates the use of a number of new elements, particularly relevant to the success of a business, such as the increased involvement of cooperative business players within it in order to obtain the best results, along with the belief that only together they can generate a mutually beneficial competitive advantage, which eventually results in highly developed networks of relations from which all have something to gain. In this way the relational marketing finds complementarity in the management of stakeholders.

The stakeholders' theory has not yet acquired any full theoretical status (Mitchell et al. 1997), because balancing out the interests of all actors involved in a business is a matter which involves many details, aspects and has multiple implications. This approach requires a change in the mentality of all stakeholders, according to medium- and long-term interests prevail over the short-term ones. On the other hand, a number of repeatable positive experiences that involve stakeholders while running the businesses under good conditions, in order to obtain success for all those associated, create real premises for an *improved degree of mutual trust*. Confidence is another dimension of economic theory (Hunt and Morgan 1994): it is "cementing" links in existing networks between stakeholders and it is developing their predispositions towards consolidating an ethical governance system.

Ethical behavior plays a significant role, not only in buying/selling relationships, but also in the sphere of marketing research, which contributes through its overall results to the development, substantiation and better orientation of such businesses. An ethical behavior of a marketing research company is required not only in order to comply with regulations, rules, canons, and/or work requirements of morality, but also because a contrary reaction can generate *organizational, personal, psychological, and/or external high costs* (Lambin et al. 2005), respectively it may have an eminently negative impact upon all organizational actions. In the case of unethical behavior, an organization must fully assume financial costs, but also image related ones that could lead to immense market share losses, reducing turnover, diminishing the whole company's credibility among the target client groups.

Obviously, involving the company in unethical behavior can generate adverse behavior among its own staff, which, in the end, will lead to the loss of confidence in the management of the organization and to its dismissal. Infringement on the environmental protection legislation, nature pollution, the lack of involvement in social actions, the exploitation of employees through work or their inadequate remuneration, failure to respect internal rules of conduct, etc., supporting untrue

claims or which do not comply with the beliefs of the population or with the opinions of neutral organizations, together with the exponential exploitation of resources in order to obtain by any means major profits, can lead, due to modern means of communication and access to growing social networks, to major external losses that are hard to anticipate and assess. In fact, an unethical company can cause significant prejudice to the reliability of marketing businesses, to the marketer's credibility, developing a totally unfavorable opinion among stakeholders, and especially among its traditional clientage, and the potential one. Among consumers living in our modern consumerist society, there is a fueled perception, according to which marketing relentlessly pursues, at any price and in any conditions, increasing of sales, manipulation of individuals and influencing them to buy the product of a certain company, even if they might not need it. Such a perception is directly related to an unethical marketing label, which, in certain special circumstances or particular cases, is really used.

In contrast to this perception we find the concept of contemporary marketing understood in symbiosis with the management of stakeholders. It aims at a proper ethical handling, towards all stakeholders participating in the business. The company's responsibility towards these individuals is not a novelty. Since the early 1930s, Berle, Means, and Chaster quoted by Keegen (2014) alleged that the corporation's responsibility is to serve society. In a formal manner, the concept has evolved in the 1970s when specialists in systems' theory had expanded research on the analysis of stakeholders and on how they may act systemically and synergistically in favor of the business in which they are involved. If the role of each stakeholder is different within a business, then the *ethical handling* should be promoted unitary between them, but to each one individually as well. Such a concept should be also promoted to those involved in research activities that make use of neuromarketing techniques and/or instruments.

8.4 Studies Focused on Neuromarketing, Ethics, and Stakeholders

Scientific literature emphasizes a number of studies in the ethical field relating to neurosciences and neuromarketing applications and research, regardless of the field of application—business administration, psychology, medicine, life sciences, etc. However, the technologies involved in the process of influencing and of better understanding consumer behavior in general, and the customers, in particular, the pursuit of an ethical approach within these studies, regardless of the number of stakeholders involved, cannot occur without calling on ethical principles (Fisher et al. 2010, pp. 230–235), in full compliance with the human rights (Ulman et al. 2015, pp. 1271–1284). Similar research addressed to stakeholders wanted to analyze the extent to which theorists, practitioners and researchers in the field of neurosciences assess the manipulative character of neuromarketing research, particularly

trying to look at ethical details, at knowledge, and at the degree in which the stakeholders were informed about the implementation of such research (Eser et al. 2011, pp. 854–868).

Ongoing ethical neuromarketing research can be used by companies to enhance the innovation of their own work (De Oliveira et al. 2015, pp. 52–64), to develop advertising campaigns (Morin 2011, pp. 131–135), and to design web pages that allow the transmission of subliminal messages (Fisher et al. 2010, pp. 230–237). However, including consumers, whether they are individuals or organizations, in neuromarketing research cannot take place without full compliance with certain ethical principles. A major challenge that companies implementing such research are facing with refers to the problem of defining standards designed to include ethical principles regarding researchers who undertake such studies, participating companies, and individuals (Olteanu 2015, pp. 191–202).

8.4.1 Neuromarketing Stakeholder and Ethics Research

Consistent with the opinion that a business's success is linked to the systematic approach of all stakeholders when aiming to achieve a common goal, the authors have resorted to carrying out qualitative research on how they (stakeholders) address the ethics of neuromarketing research within their own activities.

For this purpose, three separate investigations have been conducted with three groups of stakeholders—two international groups and a Romanian one, whose main activity is focused both on neuromarketing and on their effects. Thus, in the first extensive study, conducted in 2013 (Pop et al. 2014), the authors tested the degree of interest and involvement of companies that conduct neuromarketing studies towards ethical issues and challenges found in their activity (Study 1).

In the second study, the authors returned to a qualitative research, carried out among representatives of advertising agencies, members of the TAAN Advertising Network (www.taan.org). These companies turn to neuromarketing studies and research, in view of the development and/or implementation of advertising campaigns. Of course, they should strictly respect the best practice codes and ethical principles during their investigations and use of neuromarketing instruments in their own activities; they should also identify potential problems and/or ethical challenges to prevent them and to make them corroborate with the laws of various states, etc. The research was conducted during the second half of 2015.

The last study, implemented in the early 2016, addressed client companies in Romania that are beneficiaries of neuromarketing research applied in various fields of operational activity. This study was attended by people with higher responsibility positions within the investigated companies, who could provide an appropriate perspective regarding the impact of research that they benefited from and the ethical principles or ethical dilemmas with which they faced in the process.

The three studies intend to emphasize the fact that when addressing consumers and particularly when trying to influence their perception, motivation, and behavior,

whilst strictly respecting the rules of conduct, regulations, and laws in effect, a highly important role is played by (neuro)marketing research ethics. At the same time, respondents provide an original perspective on how they perceive neuromarketing research's ability to influence, induce, and/or manipulate the individual, for the purpose of revealing responses and/or behaviors favorable to a company, a benefit, a brand name, or a product.

8.4.2 Study 1

The first category of stakeholders to be investigated was represented by specialists working in neuromarketing research companies. By means of an empirical exploratory research of qualitative nature, we tested the degree of interest manifested by the neuromarketing company representatives towards the issue of ethics in their work (Pop et al. 2014). Companies participating in the research were mainly members of the Neuromarketing Science and Business Association (NMSBA), the professional body that brings together both practitioners and academia from neuromarketing. In this Association a code of ethics was drawn up (NMSBA Ethics 2016) for the field of neuromarketing research, with mandatory applicability for all member companies. At the time when the study was conducted (2013) NMSBA encompassed around 67 members, out of which 52 participated in the research carried out by the authors. Respondents executed neuromarketing studies in Europe (22 companies), North America (10 companies), Southern America (13), and Asia (5). Due to the fact that it ensured a quasi-global research representation in 2013, the investigation was close to the characteristics of a complete research (Cătoiu 2009; Wilson 2012). The first research aimed at getting a response from the organizations which carried out studies concerning the nature of neuromarketing ethical investigations conducted with neuromarketing techniques. The ethical dilemma stems from the fact that the results obtained from the research subjects are/or can be used to influence their responses (to sales promotion, promotional communication messages construction, etc.) without obtaining the respondents consent. Another major challenge, still of ethical nature, of these studies relates to suspicions about companies potentially manipulating individuals in order to obtain a response and/or favorable reactions to the organizations, irrespective of whether the studies carried out have only a purely educational objective, a rational one or are meant to allow for a thorough investigation of the individual's behavior (Pop and Dabija 2013).

The content research included both open-ended questions to which respondents could provide answers, highlighting their ideas and perceptions related to matters investigated, and some closed questions, measured on Likert-type scales of five steps (from one 'I strongly disagree' to five 'I strongly agree'). Regarding the types of neuromarketing studies implemented by the investigated companies, the biggest number are for advertisements (4.21), advertising campaigns (4.12), advertising

posters/banners (4.10), new products' design (3.58), sales promotions (3.46), and entertainment actions (3.06).

Respondents' perceptions differ according to the geographical area that these companies come from. Thus, video spots are the most important in North America (4.60), communication campaigns rank first in Asia (4.60), posters/banners advertising are preferred in South America (4.46) and online campaigns hold the first position (4.00) in the Near and Middle East.

Authors (Pop et al. 2014) also tested four hypotheses (H1-4). The first referred to the existence of significant differences related to the relevance of ethical objections among the neuromarketing companies and participants in these researches (H1); the second referred to the extent to which the studies undertaken generated negative moods (cognitive inhibition, anxiety, fear, etc.) (H2); the third looked at the need to implement protective ethical measures in the studies conducted (H3), the extent to which these companies turn to experts and specialists in business ethics when they conceive and undertake such studies (H4).

The beneficiaries of the neuromarketing studies care about protecting the reputation of the company they represent; they are concerned about an adequate understanding of instruments, procedures and mechanisms used within neurosciences, while for the investigated subjects more important aspects concern the nature, content and their exact type of involvement in such a research. The processing of information obtained from the studies that were carried out, and whether or not it respected ethical principles, was not of concern to the subjects. Platforms for communication and interaction in the virtual space through blogs, Facebook, YouTube, etc. may be important sources for collecting reactions coming from all stakeholders interested in neuromarketing research.

Mass-media representatives are very little or superficially informed regarding the scope and content of neuromarketing research, which makes them unable to contradict an informed point of view (Pop et al. 2013). Rather, they prefer to focus on the sensationalist side of the story, talking about the manipulative aspects of those studies, with the exclusive desire of winning over the target audience. Resuming all these observations, it can be concluded that the first hypothesis of the research has been confirmed.

Representatives of companies that carried out neuromarketing research stated, in an overwhelming proportion, that they were faced with relatively few situations in which the investigated subjects demonstrated negative states of fear, anxiety, or cognitive inhibition. Anxiety, in the opinion of about a third of the respondents, is a factor insufficiently important in generating ethical objections, in contrast to an eighth who expressed a contrary opinion. It turns out that cognitive inhibition appears to generate even lower ethical issues.

Concerning the implementation of ethical principles in the context of research, most companies request participants in neuromarketing studies to first an informing form, then to fill out a questionnaire about potential neurological pathologies, and sign a statement that indicates their consent to participate. The information is analyzed by various experts in neuroscience, thus trying to avoid possible ethical problems. In the case of identifying possible shortcomings, or certain restrictive

situations, etc., the subjects presenting a potential risk are removed from the research. Based on these results, we conclude that neuromarketing study providers do not consider their own investigations to be generating negative moods among their subjects, the second hypothesis of the research being valid.

In order to test the third hypothesis, which concerned the obligation to implement protective ethical measures when conducting studies, we sought to identify the extent to which companies carrying out neuromarketing research strictly respect or take into account the requirements of the code of ethics issued by the NMSBA (NMSBA Ethics (2016)). There are situations, such as in the United Kingdom, where all research based on fMRI techniques must be approved in advance by a national regulatory authority in the field of research ethics (Research Ethics Board). Therefore, it is desirable to ensure full compliance between commercial and medical studies conducted by neuromarketing companies (Pop et al. 2014) and/or other global organizations and commissions such as ESOMAR, the National Council for Science and Technology, the Ministry of Health of Mexico, the Ethical Research Committee of the United Kingdom, and the European Universities Code of Ethics. In fact, it was found that many companies in the field of neuromarketing research, in addition to complying with those requirements, have made up their own sets of best practices or standards of ethical conduct concerning the investigation of the various clients (subjects of these studies). In general, respondents say that they apply such internal rules/codes when they design a new research or investigation and when they collect, analyze and interpret the data. Data management is a sensitive topic among research managers, because a possible "leak" of information (confidential data regarding socio-demographic characteristics of participants, answers, attitudes, behaviors, etc.) could ruin companies' image and credibility among current and/or prospective customers. That is exactly why most companies delete the data collected after a period of time ranging from a few days to several weeks. Only consolidated results of interpretations or information processing reports are kept, the subjects being otherwise informed about these issues and technical procedures.

Children, adolescents and people with special physical or mental needs are excluded from the research. Moreover, managers have highlighted the fact that these databases are never distributed to third parties; companies could face legal actions from the participants in the studies if these databases were submitted to third parties without the prior consent of those investigated. At the same time, codes and/or internal ethical standards, which are sometimes more stringent than those of the regulating authorities mentioned above, are strictly brought to the attention of their own employees and business partners. Information collected regarding data protection and anonymity preservation allowed for the validation of hypothesis H3.

Although most of the companies that were part of the study employ specialists to do the study design, interpretation and data analysis, these specialists have limited competence in the ethics of neuromarketing research. They are bound to respect the ethics of their own discipline, the standards and/or internal codes of companies, but they align to a small degree to international ethical regulations. Therefore, when ethical issues arise, they might be sensitive to handle in the absence of experts on

ethics. While none of the investigated companies in Asia resorted to consulting experts on ethical matters, some of the companies in the USA and Europe have asked for the help of ethics experts. This finding that neuromarketing companies rarely refer to specialists in the field of research ethic in a modest proportion when it comes to conducting such studies allows us to conclude that the last hypothesis of the research (H4) is invalid.

8.4.3 Study 2

The second study was conducted among international advertising agencies. They are more familiar with traditional research techniques than with neuromarketing tools. There was only one agency that has been involved in a neuromarketing research in the past but did not face any ethical issues so far. The respondents were either General Directors or Chief Executives and were responsible for the overall strategy of their companies. The surveyed companies were from North America (7) and from different European countries (9). Even if the countries were different, they were amalgamated into homogeneous groups, because the laws that they complied with were similar. An empirical qualitative research was conducted, based on an interview guide, in order to identify the manner in which various advertising agencies relate to aspects of research ethics.

One of the first investigated aspects looked at features of traditional marketing research based on classic instruments (questionnaires, observation sheets, guides, interviews, focus groups, etc.) versus those that resort to the specific neuromarketing techniques (electroencephalography-EEG, eye tracking, galvanic skin response, facial recognition, functional nuclear magnetic resonance (fMRI), magnetoencephalography, etc.). On a 5 point Likert scale, the respondents were invited to express their extent to which they agreed with the characteristics of these two types of research. In general, traditional marketing research is considered to be ethical (3.69 average rating) and not manipulative (average rating 1.94). From the respondents' perspective, traditional marketing research is highly efficient (average rating 3.25), the results can be used to obtain relevant information about stakeholders (average rating 3.56), whether considering the motivations, attitudes, behaviors, preferences of clients (average rating 3.56), actions and/or different competitors' tactics, specific or market related situations, relations with intermediaries, suppliers, etc. In achieving their objectives, advertising agencies more often employ traditional marketing research tools (3.75 average rating). However, these tools have some limitations, as they only grant a limited "reading" of the thoughts of the research participants (average rating 2.38) and they influence or determine consumers' behavior or purchase decision (average rating term 2.31) to a certain degree. At the same time, getting a holistic, integrative perspective on all the company's stakeholders (customers, competitors, partners, etc.) is relatively limited in the traditional marketing research (2.81 average rating).

It seems that advertising agencies are somewhat familiar with the various tools and techniques used in neuromarketing, whether we refer to eye tracking, biometric measurements, EEG, fMRI, facial recognition, GSR (Galvanic Skin Response), or implicit association testing (IAT). Some of the most known techniques by the agencies are facial recognition that interprets a person's emotions based on his facial movements and IAT that quantifies the speed of reaction with which participants respond to questions from a questionnaire (Gakhal and Senior 2008; Gorgiev and Dimitriadis 2015; Blanton et al. 2006).

Some of the least known tools are GSR (1.13) and fMRI (1.38) while EEG (1.62), biometric measurements (1.69), facial recognition (1.75), and eye tracking (1.88) have a better awareness. The above tools are not so well known by the advertising agencies, either because neuromarketing is not widely used or because the agencies prefer to resort to traditional marketing research. However, in the future, neuromarketing techniques will become more important.

The representatives of the advertising agencies have been asked to compare the traditional market research approach that uses traditional instruments with neuromarketing. Out of the 16 respondents, six companies consider classical research to be ethical, three agencies consider it effective and one agency believes that this is meant to contribute to the company's goal of achieving profits. Representatives of three of the surveyed agencies believe that the classical marketing research allows them to accurately target consumers, while two participants believe that it contributes to promoting the company's services.

Respondents were then asked to assess neuromarketing on the same criteria used above for evaluating traditional research. Seven of the participants believed neuromarketing to be effective in obtaining accurate information from the participants in those studies. Two representatives believe that neuromarketing research helps the company to achieve its financial targets (profit) and to properly promote its services. Furthermore, three respondents conclude that neuromarketing research allows them to accurately target consumers.

The next question asked respondents about their perception on the ethical nature of various neuromarketing tools (they were given a brief description of each of the tools). The general opinion towards neuromarketing tools is rather negative, people considering them to be less ethical. People are more reticent to EEG (4.20), fMRI (4.08), and GSR (3.93), whereas eye tracking, biometric measurements, IAT, and facial recognition seem to generate fewer ethical issues.

Respondents were then asked: "How ethical is a market study where one can learn how people react at their subconscious level, without them being told anything?" From the responses received, it could be inferred that participants did not consider that there might be any ethical issues with that so long as the subjects of the investigations were informed about the fact that they might be subjected to subliminal messages. We argue that these investigations are ethical, because their objectives are to gain knowledge and understanding regarding consumer behavior and the way that the subconscious influences their reactions. When conducting studies on people, researchers have to inform participants about the methodologies used, about the risks they are exposing themselves to and mainly they must provide them

with any kind of information they would ask. The benefit of this approach is that researchers greatly contribute to the ethical nature of the research. If the subject is informed about the objectives and methodology of the study, be it a traditional or a neuromarketing research, and he agrees to take part in the study, then there is no ethical concern. Traditional marketing research, based on surveys, focus groups or observational trips at the mall, does not offer the most accurate insights regarding shoppers' intentions or purchasing behavior. Neuromarketing research, on the other hand, provides deep insights regarding peoples' motivations and it is more accurate than traditional marketing research. Finding the "truth" about people's reactions poses some ethical concerns, as does biomedical or astronomy research. Basically, the challenge lies in how the information gained through such investigations is used. If the information obtained under a test with radioactive substance is used to create a bomb, then surely those studies are not ethical. If, on the other hand, it is used for developing or improving technology for radiation therapy that treats certain medical problems, then those studies should be regarded as ethical. In other words, the problem is not how the information gets collected using neuromarketing techniques, but rather how it is used. The responsibility regarding the data obtained through neuromarketing research falls both with the researchers and the beneficiary companies that will use the information gained.

Participants might become suspicious and reticent when they are not fully informed about the research procedure, when their socio-demographic data is stored and when the recordings are not anonymized, therefore allowing researchers to record individual reactions and then target that specific individual based on his needs.

Another statement asked in the survey was: "the evolution of neuromarketing techniques will make them infallible in delivering persuasive messages to consumers, thus favoring the desired response from consumers." Respondents did not fully agree with this claim as they believe that consumers' reactions are influenced by the emotions that they perceive, by the way they process information, by their experiences and reactions to the change of various environmental factors. Consumers are basically responsible for their own decisions and reactions to advertising messages. Of course, targeting some consumer groups, such as young children, with messages to buy chocolate may increase their desire to buy those sweets. Targeting children with messages that promote unhealthy products is less ethical than targeting adults with similar messages, because the latter have a much greater capacity of reason and abstraction and are able, through experience and will, to "circumvent" the message and refrain, under certain conditions, from consuming a given product. However, marketing in general, and advertising in particular, even if resorting to neuromarketing techniques has not (yet) been able to send "magical" messages that determine individuals to lose their reason and to act as hoards of uncontrollable buyers, purchasing exclusively the brands or products of a single company.

Neuromarketing techniques are rather useful in understanding the processes that occur in consumers' brains, than influencing their perceptions. However, despite the exponential evolution of technology, nobody can yet claim to have fully understood the cognitive processes that take place in people's minds. Influencing consumer

behavior is and will remain an important goal of marketing, regardless of the company. Neuromarketing studies will foster better understanding of the issues that influence consumer behavior, but they will never be able to do it in such a way that a product found on the shelf of a store does to sell itself. Other views expressed that neuromarketing techniques are primarily used to test new ways of data collection, to identify special forms of communication, to analyze big data, etc. Of course, nothing is infallible. Individuals are always subject to errors that may alter their behavior, or they might want to try something new, they might be in a hassle or even careless, etc. That is precisely why neuromarketing research is the best aid in helping companies to identify the ways in which these shortcomings can be eliminated. A better understanding of neuromarketing techniques and the behaviors, attitudes, or perceptions that it measures could facilitate the decision-making process of consumers, and how society understands individuals in general. Thus, the possibility of manipulation would diminish accordingly. However, if the results obtained are used inappropriately, it can result in a catastrophe in terms of ethics, the implications of such use could be even more devastating.

Confronted with the manipulative character of neuromarketing research, interlocutors were asked: "Should neuromarketing be banned because it is manipulative?" Respondents unanimously emphasized that the ethical issues lay not in data collection, but in how data is eventually used. For example, resorting to neuromarketing research, in order to influence the election of certain politicians or political parties, would be unethical. The representatives of the surveyed advertising agencies admit the manipulative nature of advertising, claiming that this is part of our contemporary society. As it is impossible to prohibit or restrict advertising, it becomes more important how the results of the neuromarketing research are being used. Most interlocutors have argued that today's marketers must make some ethical decisions concerning the manner in which they wish to convey information about brands, products, or services to consumers, i.e., to pursue if subjects are misled by such investigative techniques. However, inducing certain reactions within consumers can take place without the use of neuromarketing techniques. Neuromarketing itself is not manipulative and, on one hand, it can help companies reduce some of their unnecessary communication expenses and consumers, on the other hand, it can help to better identify those products, brands, services that they really need. Therefore, neuromarketing becomes an ethical market research technique.

The last statement of the study was: "Neuromarketing should be used on a regular basis because it allows us to measure accurate reactions developed towards the product/service/brand/organization." Several respondents agreed that neuromarketing can be used to obtain favorable reactions towards organization, brand, product, or service. They state that many marketers are not well enough acquainted with techniques that generate valid marketing research, conducted in order to obtain the best effects. Neuromarketing, as well as traditional marketing research, can be used to measure the subjects' reactions. The use of these techniques can, to a certain extent, considerably reduce the time used in the identification of the most accurate ways of communication with the respective subjects, in order to find new, creative ways in which it can promote a product or service. Neuromarketing research should

be used especially when it is able to bring added value compared to other traditional methods of investigation, i.e., when it is considered to provide the most accurate information or when the budget allows carrying out such studies.

Recording the brain processes related to revealing personal information, such as credit card code, other safety codes for access at home or in your own safe deposit box is prohibited and punished by the ethical codes that are observed by researchers in the field. All of the respondents agreed that neuromarketing techniques should not be abused of. If the general public were more educated in terms of manipulation, the use of neuromarketing research would be more regulated and the market research would be more ethical— this was the conclusion that spun off from our research conducted among representatives of advertising agencies.

8.4.4 Study 3

The third category of stakeholders participating in the research was represented by Romanian clients, who support their business activity with marketing research results. This qualitative research has included 17 interlocutors representing business fields ranging from manufacturing to transportation, from retail to technology, from insuring to health care providers. On average, companies that responded to the survey use around 10 marketing studies annually. Two of them have used between 11 and 15 studies that were conducted with questionnaire-based interviews, observation sheets, focus groups, etc. One company said it had benefited from the results of a much larger number of marketing studies (approx. 40). Only two of the investigated companies, also resort to studies based on neuromarketing techniques (eye tracking, facial recognition, etc.). This situation indicates that organizations in Romania are more familiarized with traditional research techniques than with those that are used in neuromarketing.

Questioned about the extent to which the research that they used to justify their business activity has brought ethical issues to their attention, respondents indicated, in a majority, that they have not faced such cases. Only two of the interviewed companies (one that used five market studies in the past year and the other that has benefited from the approx. 40 marketing studies) have stated that the use of some of the studies, conducted with the help of traditional methods, have raised some ethical issues. These pertained, largely, to the way in which data about subjects is stored, to certain opinions of the participants, to the fact that they fail to identify the best individuals, and also that they must always indicate how information obtained from such research is further processed. Romanian customers' opinion about neuromarketing companies concerning the equidistance and effectiveness, ethical or manipulative character of traditional (classic) marketing research is similar to the perception of the representatives of international advertising agencies. Thus, Romanian clients believe that marketing research conducted with classic instruments are highly ethical (3.81 average rating) and effective (average rating b/d), managing only to a limited extent to "read" people thoughts (average rating 2.48) or influence their

behavior (2.45 average rating). However, marketing research should also appeal to the techniques and instruments of neuromarketing (3.90 average rating), and not just from observation sheets, questionnaires, conversation guides, etc. (average rating 3.61), which are otherwise preferred by respondents. Companies often prefer classic research because it allows for the identification of reactions and/or customer responses (3.48) which provides a clear vision of the company regarding the market situation, the environmental trends, competitors, etc. (3.16).

A similar situation to that of advertising agencies is observed with Romanian customers of neuromarketing research companies. For various reasons, objective as well as subjective, Romanian clients know only to a limited extent about neuromarketing techniques, and about their usage, regardless of whether we refer to eye tracking, biometric measurements, fMRI, GSR, etc. It is possible that for these clients as well, the use of methods, techniques, and instruments specific to classic research, provides more confidence than appealing to new instruments characteristic of neuromarketing. Even Romanian customers can have a certain reluctance related to the ethical character of these studies. They were also questioned about their perception of traditional marketing research and the one using neuromarketing techniques. Out of the 17 representatives of various companies, four appreciate traditional marketing research as being ethical and effective, helping them to get profits. The respondents seem to be less pleased with the ability of such research to address targeted consumers, only two representatives stating it while one person considers that through classic marketing research it is able to properly promote a company's benefits.

Customers' perception of neuromarketing companies and of the characteristics of this type of research is similar to that of the representatives of advertising agencies. However, no client considers neuromarketing research to be fully ethical. They appreciate, still, that it allows for the right approach towards targeted groups of clients (two respondents), and that it manages to provide maximum efficiency (seven respondents). Only three Romanian clients consider that neuromarketing studies allow companies making use of it to maximize their profit and to better promote their offer addressed to the target markets.

An initial research hypothesis starts with the premise according to which: "Romanian clients prefer classic marketing research and not the one based on techniques and tools of neuromarketing, being prejudices of ethical nature regarding the latter, which causes them fear, anxiety and other negative feelings." Considering the alleged unwillingness of Romanian customers to employ neuromarketing techniques and instruments, the authors have attributed this situation particularly to ethical aspects. Representatives of client companies were asked to what extent such research may lead to participants' feelings of anxiety, fear, cognitive inhibition, refusal of their involvement in neuromarketing research or even adverse, negative reactions. Although the respondents' evaluations are approximately neutral in relation to these aspects, cognitive inhibition (2.87), anxiety (2.73), and fear (2.60) are more likely to occur in comparison to rejecting participation in the study (2.43) and demonstrating negative reactions (2.13). In this way we can validate our hypothesis

according to which, in Romania, ethical prejudices towards neuromarketing research generate a series of negative feelings for the participants.

Some clients of neuromarketing companies consider that resorting to various neuromarketing tools also raises some ethical questions. Questioned about the ethical character of these instruments, they show a moderately negative opinion. In fact, these tools are rated as more ethical, especially if the rules and regulations in force are respected, and if they can contribute to obtaining the best expected results. More consistent challenges of an ethical nature are recorded, according to Romanian customers, in the case of fMRI, EEG, and GSR, while the most innocuous tools are rated to be eye tracking tests, implicit tests and facial recognition.

Confronted with the question "How ethical is a market study from which you can learn how people react at their subconscious level without them being told anything?", the representatives of Romanian companies were prompted to highlight the extent to which they consider that it is ethical to use a market study in order to learn how people react at a subconscious level, without bringing this information to the subjects' attention. Some respondents declared that they were somewhat reluctant, stating that they do not believe that these studies can be implemented, while others were of the opinion that if such cases occur, then they are certainly lacking in work ethics, especially when they are not brought to the subjects' attention. The decision whether an investigation that influences the subconscious is ethical or not, largely depends on the investigated theme, and on the set objectives. If some of these are purely scientific and if the participants have been informed in advance of such situations, then perhaps the study could be classified as ethical. An ethical issue may arise when, although the subject has given his/her consent to participate in the research and was informed of the nature of the study, the researcher does not inform him/her, at the end, on the results of the research and on how data will be used, etc. Another situation that may be considered unethical is that in which the conducted research invades the privacy of the subject, when he/she is asked awkward questions, or he/she is put in unpleasant situations. Further exploitation, especially for commercial and academic purposes, of study results without having the subject's consent concerning the nature of the supplied data, their form of presentation and the place where they are disseminated, represents a serious violation act of public morality and professional ethics, being a completely unethical approach. "Reading" the hidden thoughts of an individual and especially "publishing" them, regardless of the nature of the research, is certainly an unethical situation. Thus, neuromarketing research can be used for both favorable and unfavorable goals. If the data is used to improve, to increase the quality of people's lives, or to correct certain errors or shortcomings, to find an appropriate solution or treatment for anxiety states, fear, cognitive inhibition, for what represents compulsive shopping/buying behavior (shopaholics), for giving up certain pathological addictions (smoking, overly drinking, gambling, etc.), then there should not be any issue with the ethical nature of such research. That is why researchers should pay special attention to the way in which data is collected, to properly informing the participants before, during, and after the research, and after obtaining their final reports.

Confronted with the statement: "Does the evolution of neuromarketing techniques rendered them infallible in sending the right messages to consumers, encouraging the desired response?" respondents included in the research have shown a relatively unified point of view. Their opinion was that something like this is improbable or impossible, and that this idea is overrated. Two interlocutors considered that such an approach might have a chance of becoming reality in a more distant future.

The statement "Neuromarketing should be banned because it's manipulative" was flatly rejected by all sides. In short, their answers showed that neuromarketing is considered to be an ethical method of investigation, that technique is not manipulative, but it can be handled wrongly, erroneously, towards a direction through which participants can be manipulated or answers that the company pursues are extracted. In fact, neuromarketing research should take place in a very well regulated setting, so that the information obtained from the subjects is not used to cause problems or to do any harm. The vast majority of participants claimed that using neuromarketing research results on uncertified or uninformed consumers/persons/individuals can be considered a manipulative technique outside of ethical norms. A good number of respondents pointed out that "in the end, it depends on the individual if he/she wishes to be manipulated and/or influenced by a particular company, whether he/she follows promotional messages or other research findings of neuromarketing research, and if he/she purchases as a result of such actions." Just as manipulative can be considered the different scams that retailers, for example, sometimes apply: particular types of smell in some aisles, attractive merchandising, how products are packaged and/or presented, special and/or promotional prices for goods, etc. Such elements certainly have an influence on the human brain, but, ultimately, the human being, one that is perfectly rational, must decide whether or not he/she should be influenced by such actions.

Finally, the claim that states: *"Neuromarketing should be used all the time because it allows for obtaining favorable reactions for the product/service/trade mark/organization"* was met with quasi-total agreement from the participants in the study. Companies could take advantage to a certain extent from these techniques and/or instruments if they use them often enough, being even ethical if they are used for a long period of time. Of course, in relation to this general claim we believe that opinions will diversify once an increasing number of companies resort to such investigations. However, while conducting neuromarketing studies and research, the company must take care that they strictly comply with a code of ethical conduct, with their own standards, and in particular, that they contribute with real added value to the achievement of the strategic objectives for the organization, enabling it to obtain the best results in conditions of fair competition and fair play. Regardless of the situation in which companies resort to such methods and techniques, the respondents consider that neuromarketing instruments should complement and/or be used in conjunction with the classic research. One respondent considered that neuromarketing research should not be used in order to obtain favorable reactions that benefit an organization.

8.5 Conclusions

These three studies surveyed representatives of three stakeholder categories. The first category included companies specializing in neuromarketing research while the second category looked at creators of advertising services (one of the most common field of applications for neuromarketing research insights). Finally, the third category of stakeholders, originating from an emerging country, was represented by companies that are potential beneficiaries of such studies, for the support of their own businesses.

The interests of the three stakeholders' categories in relation to the issue of ethics in neuromarketing are most strongly expressed in the first category (see study 1), then they diminish in the second category (see study 2), being more limited in the third category of stakeholders (see study 3). Such a drop in intensity is justified by the fact that in the first category we have companies with a business activity that consists of neuromarketing research. The concern for research ethics runs deeper when ethics have direct implications in vital areas (such as health care) and in areas in which strict respect for investigation protocols (Cerf et al. 2015) bans studies that do not strictly comply with all regulations of the clinics where the investigation takes place. Neuromarketing research with commercial applications is still not governed by such strict rules.

For the stakeholders represented by international advertising agencies it is important, however, to quantify the link between specific research and their exploitation in the design of advertising messages intended to guide and stimulate sales. That is why the relationship between neuropsychological measurements and demand elasticity, under the impulse of the advertising message (Venkatraman et al. 2015), requires in-depth studying. Ethical requirements would impose a relative detachment from short-term goals, reflected in the profitability of each business, favoring a more altruistic approach that focuses on medium-term and long-term objectives such as building the company image and increasing brand awareness.

In the case of a third stakeholders category, although they originate from a single market and cannot be directly compared with the other two categories, a lower concern towards the problems of neuromarketing research ethics is motivated, on the one hand, by a reduced knowledge of the research mechanisms, and on the other hand, by the diminished ethical responsibility, as they are only benefiting from the results of such investigations. Even within this last category, estimations for future purchases based on neuromarketing studies significantly depend on the specific used technique (Telpaz et al. 2015), and on the category of goods that needs support, for example, the relevance of such research for luxury products and brands (Pozharliev et al. 2015).

All three undertaken studies have led to the conclusion that a more rigorous ethical education, both for the general public, and especially for research companies or for the beneficiaries of these studies, is needed. Such an approach has to be correlated with the spectacular proliferation of information in the digital age, and with the ease with which the general public can directly access it. Furthermore, the

abundance of information available on social media and other online channels, that is usually unfiltered by a rigorous scientific process, generates polarized opinions among all categories of stakeholders, whether participants in such investigations or beneficiaries of the results of such investigations. The need for a deontological conduct and a relatively unitary code of ethics for all neuromarketing studies is essential for all the stakeholders involved in a business relationship.

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Chapter 9
Dealing with the Devils: The Responsibility of Neuromarketing Practitioners in Conducting Research for Ethically Questionable Client Agendas

Kimberly Rose Clark

9.1 Introduction

Interest in the practice of neuromarketing has exploded in the early years of the twenty-first century. Researchers have pointed to the exponential increase in online searches for the phrase "neuromarketing" (Plassmann et al. 2012) (Fig. 9.1).

In the popular blog "Neuromarketing: Where Brain Science and Marketing Meet," a post from the second quarter of 2015 classified 31 firms as practitioners of neuromarketing techniques, while close to 100 firms worldwide choose to define themselves under the umbrella of the Neuromarketing Science and Business Association (NMSBA). The New Yorker Magazine, a mainstream news outlet, has recently given credence to the legitimacy of the industry by exampling the success of specific research based in social and affective neuroscience, their article alluding to the fact that the neuromarketing field has "finally arrived" at a place to provide meaningful insights (Jarrett 2015).

As such firms grow, so do the types of businesses who employ their services in the hopes to harness the nonverbal responses that fall largely outside of awareness and to sway consumer decisions. The types of companies who have publically reported use of neuromarketing tools in their market research and advertising initiatives range widely from consumer packaged goods manufacturers (CPMGs), such as Campbell's Soups and Frito Lay (Fox 2010; Nobel 2013)[1] to automobile makers

[1] Campbells utilized specific physiological data information derived from the sweat emitted from the skin and patterns of changes related to the heart's beat and to ascertain psychophysiological measures of emotional arousal and engagement as success metrics to branded shelf stable soups and juices. Frito Lay applied learnings from EEG-based scalp signal to understand precisely how consumers responded to key brand color and flavor signatures of their product.

K.R. Clark (✉)
Dartmouth College, Hanover, NH, USA
e-mail: Kimberly.R.Clark@dartmouth.edu

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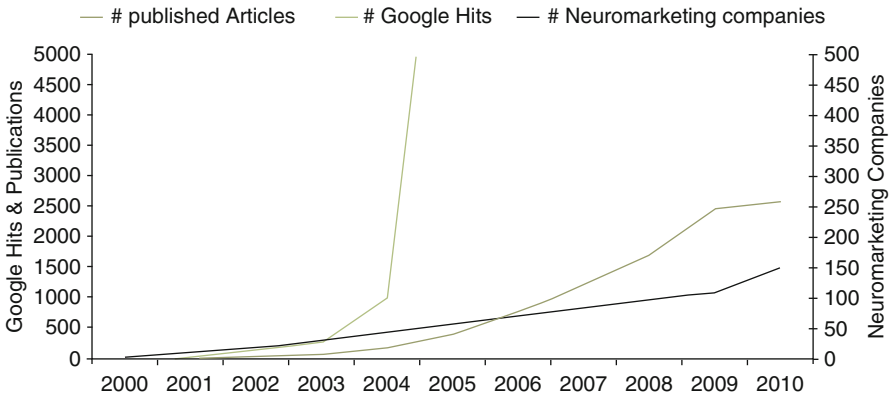

Fig. 9.1 Growth of industry. *Source*: Plassmann et al. (2012)

(Wells 2010)[2] to clothing retailers, such as Uniqlo, who harnessed EEG signals to derive consumer's t-shirt preference (Kirk 2015). With the rise of practitioners, the acceptance of neuromarketing's added utility in understanding the consumer, and an increase in client-side adoption of neuromarketing measures, it is clear that applied neuroscience is here to stay. The question then must be put forth to its field's practitioners: *When it comes to working for potentially dubious or questionable client purposes, where will the ethical lines be drawn?*

Academicians who are focused on the ethical consequences of neuromarketing have largely two primary considerations: (1) Protection of individual consumers who may be harmed or exploited by research, marketing, or deployment of neuromarketing procedures and (2) protection of the consumer's autonomy if neuromarketing-derived applications reach a critical mass in their ability to persuade consumers (Murphy et al. 2008). Both issues have considerable implications for neuromarketing practitioners whose services may be propositioned by individuals or corporations that lack ethical workplace conditions, who have historically misrepresented the health or safety benefits of their products or whose products or services carry known dangers to society. Before a full discussion of how neuromarketers fit into advertising or marketing applications of any kind, the history of "nefarious messaging" must first be considered.

9.2 A Brief Review of Ethical Misconduct in Marketing Endeavors

Prior to the existence of neuromarketing, the advertising industry maintains historic roots crossing ethical lines in multiple attempts to persuade the consumer, either by misrepresenting product benefits or actively choosing to minimize

[2] New Scientist journal undertook an exercise in which three versions of the front cover of one issue were tested using neuromarketing techniques.

known dangers of some consumables. Cigarettes makers were among the first guilty of such ethical offenses, falsely touting their benefit as an aid to digestion following meals even at the dawn of modern advertising. From 1936 to 1939, Camel Brand of Cigarettes ran the "For your digestion's sake, smoke Camels" campaign, which used a series of advertisements implying digestion was aided by smoking Camels because of the purported change to the stomach's pH balance following their cigarettes (Fig. 9.2).

Camel claimed to have derived its digestion "facts" on studies conducted at Cornell University, but such facts were illusory. By 1951, the United States Federal Trade Commission (FTC) issued a cease-and-desist order prohibiting the cigarette maker from portraying Camels as aiding "digestion in any respect" (Peeler 1996). The FTC mandate was considered ineffective and too late to matter, as the ad campaign in question had already come to its natural completion. The damage to those who smoked to aid digestion had already been done. In addition to easing the health risk burden for smokers, the campaign created a population of consumers who may not have otherwise chosen to smoke tobacco and may have gone against their intuition or inherent beliefs, only choosing to smoke as a result of the Camel ad's persuasive influence.

Product manufacturers in recent times have been called out for misrepresenting factual information regarding health benefits of their products, or false advertising concerning the safety of certain product ingredients. Regarding the former issue, consider the post millennial trend of wearing athletic shoes from the Sketchers brand, whose Shape-Ups shoes' form factor included a convex sole that was backed by third party statistics promoting increased effectiveness at weight loss and muscle toning relative to traditional shoes.

In 2012, it was revealed that the "independent" statistics supporting the shoe's health benefits were actually derived from a study commissioned by the shoe maker and carried out by the husband of the firm's marketing executive. As a consequence, Sketchers reached a $40 million settlement with the Federal Trade Commission for making scientifically unfounded claims about its sneakers (Hiscott 2014).

Manufacturers of consumables routinely misrepresent ingredients (Hiscott 2014), alter the definitions of health and nutrition information (Strom 2012), or even inflate consumer's perception of the amount of a product in a given package[3] (Ng 2015). The instances exampled thus far have illustrated prior marketing and branding initiatives which carried explicit messages that misrepresented key attributes for the purpose of increasing a product's desirability. While these marketing campaigns are clearly reprehensible, there is a more insidious side to historic advertising known as "stealth marketing" that bears discussion because it sets the context for ethical issues related to neuromarketing. This type of marketing lends itself to the subtle persuasive cues that neuroscience-derived insights could readily facilitate, potentially impacting consumers below their threshold of conscious awareness.

[3]The process of creating packaging that presents the illusion that a greater amount of product is contained within the package is deemed "slack-fill." In the United States, laws are in place to protect the consumer against this practice.

Fig. 9.2 Camel cigarettes. *Source*: from the collection of Stanford Research into the Impact of Tobacco Advertising (tobacco.stanford.edu)

The historic precedent for *stealth marketing* has roots in the 1950s era in the United States. A vocal marketing executive claimed to have influenced consumer behavior through subliminal primes, flashing interspersed visual primes such as "Drink Coca-Cola" and "Eat Popcorn" throughout the movie (Vicary 1951).

While the veracity of this research has been questioned (Karremans et al. 2006), the national media's strongly negative response to the notion of the public being covertly influenced was readily apparent. The September 21, 1957 New Yorker declared: "Minds have been entered and broken" (Moore 1982). This considerable outrage was born out of a fear that product manufacturers of relatively benign products were potentially manipulating the consumer populous in an unknowing fashion. One must consider for a moment that neuromarketing research did not factor into either the historic or modern issues exampled thus far, which intended to exploit consumers in varying degrees of unethical branding practices. The question remains: where might ethics be at odds with the practice of neuromarketing, and what can practitioners in the field do to assure sound ethical pursuits when it comes to servicing a client?

9.3 From Stealth Marketing to Stealth Neuromarketing

Discussions surrounding "stealth neuromarketing" are on the rise, pointing to potential ethical concerns surrounding use of neuroscientific tools in marketing research initiatives. Stealth neuromarketing is defined as "the point in which neuromarketing techniques reach critical effectiveness, and are used in such a way to manipulate consumer decisions without their knowledge or consent." Privacy advocates are concerned that applications derived from neuromarketing insights might one day threaten individual autonomy if this technology were able to effectively influence consumer behavior (Murphy et al. 2008).

Even if individual consumers never actively participate in neuromarketing studies, results of such studies have the potential to impact their decisions without them ever becoming cognizant of any persuasive tactics being deployed. In fact, the power of neuromarketing measures has been found even when small participant samples are tested. Dmochowski et al. recently found that everyday stimuli, such as popular television shows, evoke highly reliable brain activity across the viewing audience. Using electrical changes in the scalp's skin conductance via electroencephalograms (EEG) and changes to specific cortical areas in the blood oxygen dependence level (BOLD signal) through functional magnetic resonance imaging (fMRI), Dmochowski's team found that the level of inter-subject correlation in the evoked encephalographic responses predicted the expressed interest and preference among thousands of people, suggesting that particularly favorable stimuli may cause our brains respond in a stereotypical manner that is shared by our peers (Dmochowski et al. 2014).

A second study utilizing a small sample population predicted the success of an antismoking campaign in driving calls to a smoking cessation hotline (Falk et al. 2011). This study compared differences in targeted brain activity within the prefrontal cortex linked to positive response in message preference with self-reported of ad preference. Research findings from this work suggest that brain activity to specific ads was a better predictor of the general population's hotline call volume than what was predicted by the explicit self-reported ad preference. This work corroborates

the notion that the neurological reactions that may actually differ from opinions expressed verbally and that occur outside of conscious awareness, can predict the responses of many other people to ad campaigns promoting specific behaviors.

A final example of shared response, which has quickly become a classic exemplar of our human predisposition to "tick collectively," was evidenced by Uri Hasson and colleagues who sampled only five participants neural responses, via fMRI, while watching scenes from The Good, the Bad and the Ugly. They found that the movie clips elicited highly similar, synchronous brain activity across multiple brain regions across all the participants (Hasson et al. 2010).

Understanding such societal predictability to specific stimuli potentially increases the probability of it being harnessed in ways that are not ethical or in the best interest of the masses. Such research can be thought of as laying out a neural roadmap to why some videos, songs, behaviors, and memes go viral, moving from one person to many thousands of others via social media. The findings are relevant to political advertising, commercial market research, and public health campaigns, and broaden the use of brain imaging from a diagnostic to a predictive tool, yet in the wrong hands, such powerful tools can be considered weapons that might inflict harm to society if harnessed to serve unethical agendas.

9.4 Examples of What Could, but What Shouldn't Be Tested via Neuromarketing

Alcohol, tobacco, and other product firms who knowingly manufacture and sell consumables that cause health problems among many consumers, garner success by the very nature of understanding the different types of hedonic need states their products satisfy. If such entities were to carry out specific A|B testing for marketing messages that take advantage of the dynamic nature of human decision-making, messaging could be manufactured that best resonates with an individual to persuade them to engage in a product related activity they may not have otherwise chosen to do. Consider self-regulation, or will power, research, which some in the social and affective neuroscience community liken to a muscle that can be fatigued given the appropriate inputs (Muraven and Baumeister 2000). Once this neural "muscle" is fatigued, consumer's rational choice, which has been argued is a critical component of being a consumer, is likely lessened. If rational choice is linked to an ebbing energy store of self-control as some suggest, a consumer's free will to act rationally is necessarily compromised (Baumeister et al. 2007, 2008). If manufacturers of controversial products begin to employ neuromarketing techniques to understand brand's message efficacy occurring under the radar of conscious awareness, a consumer's free will *not* to choose the promoted product could be seriously hindered.

Current cultural discussions related to the power of neuromarketing measures relies on the argument that the bulk of human decision-making is born out as a result of nonconscious influencers (Dijksterhuis et al. 2006). While such deliberation

occurs outside of conscious awareness, consumer choices are made up of both conscious and unconscious inputs. In fact, philosophers are largely in agreement that human behaviors are manifested by a blend of conscious and unconscious processes working together to meet an individual's critical needs and facilitating important goal pursuits (Baumeister and Bargh 2014). As such, it is expected that future research will put greater emphasis on the interactions between conscious and unconscious influences (Simonson 2005). Overt marketing from firms with questionable ethical agendas *could* employ a two-pronged attack on the free will of consumers by marketing to both their rational, cognitive deliberations while simultaneously persuading with stealth measures that work to influence the consumer outside of their conscious awareness. Without the insights afforded by applied neuroscience, such an attack could not be possible.

9.5 Current Industry Standards in Ethical Considerations of Client Relations

Neuromarketing practitioners have an enormous and diverse ethical responsibility in assuring ethical treatment of participants, not solely within targeted research initiatives, but also to society as a whole in limiting the dissemination of insights and their potential applications to those that will not put the health or safety of society at knowing risk. It is evident that neuromarketing firms are the modern day Atlas, holding up the necessary burden of ethical practice when taking on clients with potentially dubious agendas.

Early on, as the field of neuromarketing was being to coalesce, a code of ethics was suggested in order to "promote research and development, deployment, entrepreneurship, and profitable enterprise alongside beneficent and non-harmful use of neuroimaging technology at all stages of development, deployment, and dissemination" (Murphy et al. 2008). The Neuromarketing Science and Business Association heeded the call for ethical conduct by creating the "NMSBA Code of Ethics" which works to address potential issues neuromarketing practitioners might face as a consequence of conducting applied research for commercial (Neuromarketing Science & Business Association 2013).

The treatise lays out core principles surrounding member's maintenance of research standards, participants' rights with respect to anonymity, transparency in research execution, subject's voluntary consent, and the protection of minors. While many points touched on in the Code are important in any research related to the protection of human subjects, it does not specifically address the prohibition of its members in working for potentially controversial entities, such as big tobacco, pharmaceuticals, alcohol, guns, politicians, or certain special interest groups. Such groups could inflict a more efficacious and expedient harm on society when armed with certain consumer-centric knowledge garnered from neuromarketing measures. There is a growing interest in NMSBA community members

to reframe the Code to articulate the values of the industry and determine business priorities in order to create a balance between external ethical concerns and internal business interests. In short, neuromarketing firms have perceived white space when it comes on the capitalization of strategic advantages of ethical practice.

Though the NMSBA is still in its relative infancy and has not yet addressed "working for the devil" directly in the current iteration of its Code, NMSBA members are actively working toward a shared vision in actively conducting pro bono research on an international scale which moves to subvert the marketing messaging of at least one of the devils: big tobacco. In March of 2015, members of the NMSBA released results of the "Neuro Against Smoking" study at their World Forum in Barcelona, Spain (Matukin 2015). Member researchers from 24 countries conducted what is to date the largest study on tobacco health warnings. The main agenda of the NAS initiative was: To support the World Health Organization, to promote healthy lifestyle, to propagate a tobacco free environment, to aid societies and governments in their fight against smoking, and to bring valuable new insights to the existing discussion on cigarette warnings.

Though the antismoking research was carried out by a relatively small proportion of NMSBA members, the importance of ethical concerns of the larger member base was only recently ascertained. An international exploratory study of NMSBA member practitioners was conducted to empirically assess beliefs and practices related to ethical concerns faced by the member practitioners as well as the beneficiaries of neuromarketing research insights (Pop et al. 2014). Results of the study were based from hypothesis testing and found a significant discrepancy between the reported relevance of ethical objections which arise from clients compared to those which arise from research subjects. Practitioner respondents reported that their client-side end users of neuromarketing insights considered ethical objections at the societal level against this type of information gathering about their consumers as it might negatively impact their company in popular media. Neuromarketing research subjects, on the other hand, were reported to be most concerned about the transparency and understanding of the tools used during their participation in such research initiatives. On the neuromarketing practitioner side, that the majority of firms do not believe their studies can trigger negative moods in their research participants and all agree to adopting data security and privacy assurance of participants. It is clear that NMSBA member practitioners hold a high degree of concern to maintaining ethical conduct with respect to their research subjects.

9.6 Future Directions

In the not-so-distant future both market research and neuromarketers will find success in new technologies that will harness psychophysiological responses of the masses which will serve as proxies to some brain processes. "Standoff" technologies, such as thermal cameras, will assess the temperature of every individual in a

room as a concommittment measure of emotional engagement. Wearables, such as wrist watches, will provide data on the wearer's level of mental preoccupation by measuring heart rate variability following test messaging. Data from both tethered and stand-off human "reads" will be coupled with "smart" marketing technology, leading to real-time dynamic messaging, tailored to proximal markets of one. Individuals will be vulnerable in a majority of consumer contexts as well as their own homes as a result of such technological alignments. The question of ethical neuromarketing practices has less to do with the careful scientists who self-categorize themselves as neuromarketers and more to do with questionable applications of marketers or product manufacturers who will learn from more venerable research. This type of feedback will be unethical if it is ultimately used to create messages aimed at boosting sales, but which do not truly mirror the agendas of products or initiatives (Wilson et al. 2008).

To the question of whether neuromarketing practitioners should engage in work for potentially questionable agendas or products that risk the health or security of our society, the short answer to it is "just say no." The potential for societal harm and manipulation of free will could come back to haunt them, even outside of their own awareness.

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Chapter 10
The Limits and the Ethics of Consumer Profiling

Nansi Lungu

10.1 Introduction

Throughout time, one of the roles of ethics was to preserve beneficial ways of living for us as society and individuals. Science will try to increase our power of prediction. It is the eternal play between the conservation and adaptation forces. It is a play with steady state, with a homeostasis state that offers us the possibility to make decisions for the future at ease. It is a world in a steady state. It is a world in a dynamic balance. A fragile one. Understanding the rules of this game can lead to even removing them. The story of neuroscience begins where knowledge questions itself. Understanding the way we understand could be the Holy Grail of knowledge. Or the gate to the worst nightmares. Or possibly, this stake is a mere product of our imagination through which we idealize the efficiency of some methods that are much too primitive to make a significant change at the level of species.

In the 1990s, genetics has given us the fear not to become Gods before becoming human beings. Today, new candidates joined: neuroscience, nanoscience, and artificial intelligence. And if the latter, due to regulations and limitations, have so far unnoticeable side effects, neuroscience can easily be put into practice with unknown side effects that need to be anticipated. Neuroscience has simply outreached the academic field in search for practicality, before reaching maturity as a science. And neuromarketing, the prodigal son of neuroscience, seems to take a path that is worth following. The fear that neuromarketing creates is determined by the fact that we idealize the power neuromarketing might have. If it were to succeed, the rate of change might become too high for the conservative forces. Before we could understand what happened, the balance would be lost.

N. Lungu (✉)
Titu Maiorescu University, Bitdefender, Romania
e-mail: nansialexandria@yahoo.com

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Ethics is effective when it has sufficient time to readapt to the new conditions. Having enough time and the information provided by reality once a phenomenon occurs, in most of the cases people succeed in readjusting the ethical framework so that the new regulations do not allow significant adverse effects. For this reason, a cautious-by-anticipation attitude is not completely devoid of meaning even if in the end it proves to be ungrounded. We need time and caution especially in times when the pace of change has considerably increased. A theoretical solution to the ethical issues is only a part of the question of solving the more complex further implications. The dynamics of our ethics will be continuously conditioned by/always depend on the dynamics of technology and of everyday activities. Neuroscience has rather high stakes at least for the time being. Compared to the threats of genetics, the threats of neuroscience seem subtler and therefore serious. The genetic modification of the human beings encounters a firm opposition both in the public mindset and in the scientific world. And when things are not clear people prefer to behave rather defensively (see the study on embryos in the USA). As for neurosciences there are more complex implications which are difficult to be considered in a critical thinking manner.

Although initial enthusiasm on its potential has fallen below certain aspects, neuromarketing kept in recent years a recognition of the role it could play in consumer profiling.

If the potential of profiling and influencing increases significantly as we suspect will be the case in upcoming years, we must warn that it will not be enough to develop regulations on neuromarketing, nor the practical mechanisms to verify such regulations. There are not such mechanisms at the moment. Now, we do not understand what we avoid except for some of the obvious issues. The big data obtained from various devices, machine learning, and neuroscience will create a multiverse of ethical issues.

Neuromarketing is a technique which makes promises and threats. Neuromarketing is not a science yet. And like any other technique the way in which we use is in itself either or ethical or unethical.

The promise made by neuromarketing wakes up both admiration and fear: the possibility to open doors always thought to be closed to a third person research, namely on our subjective inner world, the way in which we can feel, the way in which we make decisions even beyond our self-knowledge. But it is very controversial how far this approach can be developed. The improvements neuromarketing brings are far from being unanimously accepted.

In 2011, the French Parliament prohibited any use of neuroscience for commercial purpose while, according to Business Week, Richard Thaler expressed his disbelief over the fact that neuro-studies could contribute to the study of behavioral economics and that economists should leave the issues of neuroscience to neuroresearchers. The difference between the two perspectives indicates the heterogeneous nature of the prospect of profiling. And these two differences determine two distinct types of ethics.

When considering the limitations of consumer profiling, we have to focus on two dimensions:

1. The acceptable limits from an ethical point of view. There is personal information that can be easily identified, thus it should not be revealed to the open public—the right to a private life (health condition, private activities)
2. The limits of the power of profiling. Predictions and influences that can be carried out beyond our ability of anticipation

Besides these consumer-related concerns, we can consider an ethical matter generated by the interpretation of results regarding both consumers and clients of the neuromarketing companies.

One of the threats with the highest negative ethical potential is the exaggeration and false understanding of the results, aspect which will be discussed further in this chapter. The interdependence is obvious in this case. The higher the power of prediction is the more articulate our ethics should be. The limit of the power of prediction will determine how specific our ethics should become. As we will show later this is not clearly how it will be carried out in all cases.

10.2 The Beginning of Neuromarketing

The shortcomings of investigating what people want, the way they act, or the way they make their choices was known long before neuromarketing appeared. Even when they are honest people tend to please the interviewer, they describe the way in which they believe the way they act. They have selective memory in order to manipulate others and to protect their own self (Trivers 2013). This led to the unreliability of the subjects' answers. Neuromarketing took benefit from this unreliability gap/filled the unreliability gap (O'Connel et al. 2011). Neuromarketing is an interdisciplinary field based on neuroeconomic research but with pragmatic purposes such as increase in sales, improvement of marketing techniques (Ariely and Berns 2010), or advertising. Direct access to nonconscious reactions of the body or to the neural structures, unfiltered by the conscious mind, has been considered to be more trustworthy than any telling (Reimann et al. 2011). In addition, this approach might enable us to understand not only what people want but also how their wish is build.

The process of knowledge starts with collecting the data, the interpretation of results, the development of a theory, and the validation of predictions made. Any mature scientific field meets these stages to a greater extent. Unfortunately, neuromarketing does not succeed in meeting these stages every time. But neuromarketing is not to be considered science even though some of its findings can contribute to scientific field. Neuromarketing tries to go beyond the limitations of the academic rigor. The focus in neuromarketing is on the predictive results rather than their explanation. The explanations are useful as long as they support better predictions. This way the ethical issues will be more easily eluded. But in order to see the threats we have to understand well the possibilities of neuromarketing.

10.3 Measurements and Interpretations

Neuromarketing took over technologies from neurosciences, adapted them to its specific requirements, and then developed its own techniques that have not been massively used by the other neurosciences. This suggests a certain level of scientific immaturity. Today we can make more and more precise and subtle measurements on certain aspects of the human brain and behavior. But the accuracy of the measurements does not come without a price.

Neuromarketing develops a series of measurement techniques: from biometric measurements (measurements of the body reaction) to measurements of brain activity. The limits of the measurements can determine the limits of profiling and the limits of neurosciences those of neuromarketing. Turning a behavioral science into a science of neural correlations is still a promise. Technically speaking, resolutions of the MRI should significantly increase. But there is an inverse proportion between the growth of spatial resolution and the temporal resolution and sensitivity. At the same time if the complexity of the task and of the neural structure became, more limitations are highlighted. For example, "if neurons are highly interleaved in the cortex, then different groups of neurons may be activated by different tasks within a single voxel, but if the same number are activated by different tasks, no difference in activation will be detectable" (Todd Constable 2012).

10.4 Interpretations and Limitations

The technological limitations are not the only existing ones and I think that they are not even the most important ones. The current perspective on neuromarketing has little evidence of scientific nature but which, to a certain degree, corresponds to intuitions deeply rooted into the human mind. Basically it is the belief that once we detect a wish, it will turn into a behavior according to that wish. This approach suggests a direct, linear causal link without significant interferences. With many neural structures involved and influenced by previous choices, by self-deceiving phenomena and other processing information mechanisms, the process of choosing is complex. The neural correlations of this process with the daily behavior are very difficult to make. Many times researchers and general public mentality tends to be essentialistic support. In other words, we are inclined to think that we have intrinsic and not contextual traits. We believe that there are absolute features and tendencies of the human mind that once found with the help of neuro-technologies can be activated to the benefit of sellers. But our mind is a relational one. Our wishes are contextual, not independent. Most of the times, we want things because other people want them, and the object of our desire changes according to the wishes of others (Christakis and Fowler 2015). Even when we want something our wish is related to a certain context that, once modified, can determine the change of the wish itself (Ariely and Berns 2010).

10.5 The Ethical Aspects of Consumer Profiling

NMSBA Code of Ethics for the Application of Neuroscience in Business (see Addenda A.1). It is an honest intention but difficult to put into practice because this field is situated at the volatile border between genuine scientific interpretation and pure speculation. Trying to benefit from any advantage in understanding the way in which the buyer reacts, there is not enough time for neuromarketing to have the validation results. Actually, this represents one of the weaknesses and at the same time strength of the field. Any research element that brings advantage in the competition is good, but this determines less time for confirmation.

Neuromarketing is a technique or a series of techniques and not a science. Based on studies, it must take into account the general ethics of any study. But it is not bound to limit itself to a complete validation, waiting for extended periods of time. In neuro-marketing, a hypothesis proves often to be as important as the complete theory.

Of course this leads to the most important problem: is neuromarketing a genuine field of scientific research? Is it bound to adhere to the rigors of scientific research?

The answer is affirmative in the case of data collecting, but in the case of data interpretation, things are rather unclear. At first we have to take into consideration the fact that the nature of the task itself is of notorious difficulty. The more respectable scientifically certified relatives of neuromarketing, neurosciences have to deal with this issue constantly and seem to not manage it. What is relevant and what is not, what systems have real or main influence, what role our conscience plays in making choices, whether the decision-making systems have control supra-systems, how information is processed on a long period of time are some of the main issues any research has to deal with. Our understanding of the functioning of the brain is still young and no possibility should be left unexplored. This needs to be said crystal clear: the choice of a product is part of the infinitely more complex activity of the human mind. We cannot completely isolate the commercial choice as if it used a cognitive module that is opaque to other types of information (see the case of Coca Cola vs. Pepsi—Morin 2011). And if you cannot do it then you must take into consideration the other areas of brain activity, the contexts, etc. This means that we should focus on the entire activity of the brain […]. But this is complicated.

At present there is not a good theory on the problem of conscience (though there are legendary authors who claim that the conscience has been explained, authors such as Daniel Dennett). If until now the fact that not all important choices are made consciously seemed surprising, today it would be surprising to discover something belonging to human conscience only. It is difficult to establish the role conscience plays in the decision-making process. Conscience remains to us such a great mystery that it appears to go beyond human nature itself. It would be ironical that one day a research study on buyers' choice making will unveil this mystery. Ironical but not impossible. But for now we are only trying to figure out what a theory of conscience would look like. Is it possible that the exaggeration of some influencing techniques can be threat to conscience itself? Despite the fact that this question

seems to have a negative answer it is worth asking because the real threat is not the loss of consciousness but the threat toward a beneficial way of being.

Secondly, once we have obtained an information that could bring us a competitive advantage or it might be able to bring those who gain from it, we will not allow it to be concluded/established for its confirmation to occur. The idea of competitiveness is precisely to dare being the first who uses a partially confirmed information. Of course that this exposes us not only to dead ends but also to a certain complicity between the one who provides the information which he knows is not quite scientific and the illusion of the interlocutor who perceives it to be scientific. The danger is to narrow down to a few formulas without alternatives. Who would be able to try something else when fMRI has shown that the amygdala "bounces up with joy" at the sight of certain images?

Standardization using pseudo-scientific or scientific argumentation is not something new, but its effects are hardly understood. The MRI has shown a high level of stress in the case of the child that is listening to Snow White fairy tale. The scene when she is poisoned with the apple should be cut. Or the stress generated by the story of Romeo and Juliet determines a reduced number of spectators coming to see the theatrical play. Changing the end would contribute to a considerable increase in the number of spectators. It can be said that this has been done already. For instance, movies such as Great Expectations have suffered changes at the public's request. But in our case scientific argumentation is needed.

Even if it is not considered to be one of the main threats of neuromarketing, paternalism, a philosophy of what should be done, will have an influence on a future ethics. What is significantly more dangerous is an epistemological confusion with important consequences on the way we understand, act, or evaluate. The assumption that there is in our brain an evolution-based universal structure that determines a certain behavior free of any influence is deeply rooted and can be found in the interpretations of neurosciences makes.

10.6 The Essentialistic Human Mind

The human mind is essentialistic. The human mind is "in love" with information which can be compressed in essences. A compressed information is a summary easy to remember and process afterwards. Furthermore, beside the minds tendency to compress information there is also the tendency that these compressions to be regarded as independent entities. In other words, we consider not only that even when we lose the initial meaning of information we like concision but we are tempted to confer an independent existence to this property. When this questions arises in the case of a person it is assumed that that person presents characteristics independently of the environment and times in which he lives (see a similar thinking mechanism in the unlimited rationality scenario—the human mind must be in a specific way disregarding the environment in which it develops).

Why does our mind have rather this incorrect tendency from an epistemic point of view namely is more inclined towards essences than towards contexts? The answer must be somewhere in the evolutionary history of the development of the human mind. In the first place is easier to essentialize than to attempt to understand contexts. It is difficult to try to understand what are the contexts which enable a human being to have certain features and in what other contexts those features are impaired.

But the same tendency determines us to have difficulties understanding that certain contexts can alter even our most profound characteristics (see Milgram, Asch, AbuGhraib experiments, etc.). In our impulse to find essences we often forget that the context is more powerful than peoples' essences. A notorious form of essentialism is shown by conspiracy theories or how Nate Silver calls them "the most lazy form of signal analysis" (Silver 2013, p. 577) and like these theories which speak of "an irresistible instrument for saving work in the face of complexity" (HL Gates) essentialism represents a tactic for maximizing the computing power by reducing the complexity of the environment to a few constant elements. But often in the scientific research involves a trap.

This essentialism can be also applied in the neuromarketing field. When we say we are trying to "crack the neural code of our decisions" (Morin 2011), we refer to the belief that we will discover somewhere in the brain a machinery that based on complex algorithms dictates our behavior due to fundamental preferences. But in fact this assumption has deeper roots. As once we understand how this machinery works, we are able to make predictions and even to influence the machinery. Or this jump is made into an epistemological abyss.

1. First of all, such a machinery might not exist.
2. And secondly, if it exists (although now there is not a strong theory on the process of decision-making), it might only increase the chances of prediction and not produce accurate ones. And in this case, numbers are of vital importance.

For the public, this represents the fear of pushing the "buy button," that once discovered by researchers will be endlessly pushed by companies. And this fear is amplified by the fact that we will not be aware of the subtle and subliminal influences we will be exposed to.

This picture is simplistic. But this essentialism is not to be left aside. It is part of our mind and scientists cannot avoid it. Discovering this essential propensity of the brain to increase the power of prediction up to a point where we know for sure what the buyer want is irresistibly tempting. Therefore, we have to analyze some situations in order to understand the limitations of this approach.

In 2006, Matthew J. Salganik, Peter S. Dodds, and Duncan J. Watts published in the Science journal an article that highlights the difficulty of being an essentialist. The experiment consists of creating more alternative worlds (each world involving a rank of the songs presented—48 songs) that develop differently even if the original conditions are identical. The quality of the songs will play a secondary role in building the rank. Actually, only the weakest songs will not reach the top and best ones the last places. But previous choices made will influence the rank most

significantly. Due to what is called "the Matthew effect" ("those who have will have more"), the songs that had been previously chosen were even more frequently chosen afterwards. Let us now suppose that before making this experiment we have done a very detailed research on people preferences on music. The results are clear, certain songs are more attractive than others. What should be inferred from this? There is a significant correlation between the popular songs and the neural substrate. There is something innate or there is something about the songs that influence our decisions. But this conclusion is misleading.

As it is well shown in the experiment led by Matthew J. Salganik, Peter S. Dodds, and Duncan J. Watts, choices can be more strongly influenced by context than by the "essential" link between what we want and the desired item, link which can be described in an fMRI research. Certainly, it can be argued here that by analyzing neural reactions while subjects pick different songs might pinpoint our choosing mechanism. In fact, this would also be my opinion, but it strongly undermines the essentialist standpoint. There is no need for a neural structure as long as the environment through its pressures eliminates the influences. But from essentialistic point of view we thought that we have found a structure which determines our choices. As it was stated by Nicolas Christakis and James Fowler: "there is no true or accurate value of the melody in discussion. The value and quality of each song depends on a unique process which is incidentally leading to the creation of a certain sequence of people who make choices" (Christakis and Fowler 2015, p. 159). In some cases, it is better to observe your friends behavior than to look for reasons in your mind.

Why are these distinctions so important? Contextualism might represent a general limitation of any future profiling. Perhaps the future profiling of groups might prove to be more effective. Or perhaps the analysis of the context will be possible and will be more relevant. But this should not eliminate or limit a neuro-analysis.

It can be said that an essentialist analysis should not exclude a contextualist one, at least not on a theoretical level. But in practice they limit each other. At that point, the mechanism influencing the behavior would become much more complex. This aspect is very well highlighted by Colin Camerer in Lone Franke's book: "The neuroscientist also believes that the core of an economic decision is money. But the central is trade-offs." You only have so much time and so much money, and you always prioritize things, since everything has value. Money is just one of them. If the result of an efficient profiling will heavily depend on the social or economic context, then our fear that information on how we will act based on what our neural structures show should be moderated.

Going a little further, we can try to imagine what would have happened with these ranks if all those involved knew about the link between their favorite songs and the neural activity. Would it be possible that this correlation confirmed their belief that something about that song activates a preference in their mind? And they might have behaved as such because they knew this information and not because the link abovementioned was real.

However, we should not draw definite conclusions. It is possible that certain physical phenomena do not vary irrespective of the context. Their role that the play in our decision-making system should will be clearly defined in the future. As some

neural mechanisms involved in the process of decision-making might be likewise. Some phenomena in our brain might be independent of the context.

One of the most successful studies that have produced quite clear results and predictions made on the basis of neural activity focuses on music (Berns and Moore 2012). This experiment suggests "that the neural responses to goods are not only predictive of purchase decisions for those individuals actually scanned, but such responses generalize to the population at large and may be used to predict cultural popularity."

Surely our mind is not exclusively essentialistic. This implies a side of ethics linked not only to profiling but also to the manner in which the results of this field are transmitted. Misunderstanding of the role played by context creates the impression of a necessary link between neural activation and our behavior. This statement is more than exaggerated. This is false information. But no matter how simplistic would essentialism be it should not be ignored for it can shed an interesting light on another aspect that is profoundly connected with the animal mind and implicitly with our own minds: addictions. Another important ethical aspect during the measurements in order to discover more accurately what do people want is to be careful not to intensify the negative tendencies beyond the capacity of the mind to protect itself with its available resources.

The difficulty of some precise measurements, the difficulty to develop software for interpreting data, the absence of successful theories on consciousness and on the way in which we choose, the power of contexts and group influences, and the complexity of calculations involved severely limits the efficiency of a highly accurate prediction and probably in this regard the ethical effects of such profiling will be also diminished.

Profiling seen as an approximation tool that requires human interpretation will constitute a good indicator for increasing certain sales, perhaps even to improve the consumer experience or even to indicate more precisely what do people want. But things are about to change. Where the data about a person will come from multiple sources, where profiles might converge from various databases, where data mining will be done in a more and more automatic way, where the power and diversity of the sensors will increase, where small data will assemble with the big data, ethical threats will be amplified in a significant way.

10.7 Machine Learning, Neuromarketing Big Data: Towards an Unpredictable Profiling Future—Ethical Challenges

Neuromarketing will create a predictable alliance with the automatic profiling and big data field. The data obtained from millions (billions) of consumers generated by different sensors will be processed automatically. Because of this large number it would emerge a series of unprecedented/unnoticed correlations. Profiling are made

in order to be able to extract information for prediction operations. The machines will be able to make predictions which none of us will be able to understand. For it will be impossible to reconstruct their method of learning until then. In the field of neurosciences this alliance has already occurred with promising perspectives for a superior fMRI analysis in real time (Lorenz et al. 2016).

The relevant aspect of the ethical issue is that the machines will be able to make unexpected predictions for us. The connection between the limits of ethics and those of profiling are best highlighted by the problems which may arise from unsupervised learning versus supervised learning (Fayyad et al. 1996). When the machines are profiling under human supervision they seek to correlate the assumptions made by humans.

People's purposes are related to the way in which they understand the others. When we create someone's profile we follow certain signals which seem to be relevant for the profiling. If the assumptions made are wrong the conclusions will be incorrect too. But if they are valid, there are more chances to understand the behavior of person who is profiled.

Within the limits discussed above. But in a certain way, part of the knowledge is already presumed to exist in the computing system. In the case of supervised learning, due to the complexity of the calculations, there will be surprising conclusions or unethical contents of knowledge. This will give us access to information about other people's brains, information that they do not even presume. Evolution determined us to defend ourselves from other human minds or from ours, therefore all our strategies to preserve our privacy are built against some inaccurate computing systems. But once a system will be able to memorize all our daily activities, things become even more complicated for us.

People working in the marketing field already know things about us, things we do not have access to. But this is only the beginning and, for this reason particularly, it is not clear how much of our daily activity day-to-day work day can be inferred from our online activity.

But as I was saying, some "dead angles" will always occur depending on the assumptions of the one who requests the machine for a certain type of information. Even if—in case of a perfect profiling—the results will be beyond the foresight of the profiled person (because he will not know what elements has to hide), the profiling limitation will be linked to the assumed ontology, the intuition in use and the assumptions made. But things will get more complicated when we refer to the unsupervised automatic profiling. In this case the assumptions and assumed ontology are close to zero. Basically we are dealing with brute forcing in proposing the explanatory model. It is certain that relevance decreases while probability to pinpoint unexpected correlations increases due to the emerging ones from the "dead angles."

Unsupervised learning does not only imply learning by minimum assumptions but the results obtained could not be justified by a causal-theoretical explanation. Simply, the result is given by an irreducible process. As it can be clearly seen: "The most salient difference between organic and machine profiling may be the fact that as a citizen, consumer or employee we find ourselves in the position of being profiled, without access to the knowledge that is used to categorize and deal with us.

This seems to impair our personal freedom, because we cannot adequately anticipate the actions of those that know about us what we may not know about ourselves" (Hildebrandt 2008). In fact, this threat is much higher if the profiling is created both by the machine and man. The machine assisted man generates much more accurate predictions than each individual machine (interference and signal). Therefore, this type of threat increases with the involvement of man. The detection of patterns and prediction is significantly better if the human mind is involved.

This might be due to the capacity of the human mind to ignore the information when its surplus might create difficulties. In complex environments a good strategy is not by increasing the computing power but to reduce the distance to the prediction horizon. In addition, the human mind knows how to follow another human mind. We are dealing with a teleological system (Dennett 1989) whose intentions may not be deduced only from the syntactic calculus. The switch from the syntactic calculus to the semantic calculus will concern the minds of those working in the artificial intelligence field. If the unsupervised profiling will show us unexpected connections in our actions, machines will not be able to highlight the essential meaningful connections. Because if we partially oversee a meaning which consists of putting yourself into somebody else's shoes then the other could have a negative reaction towards you. It must be said that not all the authors agree with these conclusions stating that once the bottom-up type profiling will prove valid the causal explanation is no longer necessary. These statements are in contradiction with the neuromarketing assertion that it knows not only why something happens but also why is happening. Rooted in the philosophy of the mind and cognitive sciences, this debate is on the knowledge argument: can we understand somebody's behavior without the first person view?

Regarding the ethical aspects, once automatic profiling is possible, a few threats can be noticed:

1. People are not fully responsible anymore of profiling.
2. We will not be able to understand the way in which profiling was done. Implicitly, we will not be able to understand the way we are categorized. The understanding of the general public might also prove limited. How can we know when a company is cheating?
3. The management of our own image will not be possible anymore as long as the profiling criteria are unknown (we do not know when we are being profiled and which data is relevant).
4. The way in which our personal information is shared to companies can raise new ethical issues.

10.8 Conclusion

Once the role and limitations of a profiling, its impact on other behaviors etc., is understood by the public, it is able to decide how important the received information is. The understanding of the way in which research is done, of the way in

which a result can be interpreted will generate a more adequate reaction of the public to research in general. In the popperian spirit, we could ask ourselves how to limit the negative effects of unethical behavior when it appears, the focus not being on how to make people behave morally. I think that we will find solutions to that when we will be able to accurately understand our power of prediction based on profiling.

If the power of prediction will interfere with the preservation of our privacy and dignity, it should be drastically reduced. But this is not a decision that could be made a priori, but after we gain some experience. At this point, we have to know how powerful our predictions are and then to understand the practical mechanisms for prediction confirmation of our development should I understand how far can we predict then to understand how will show the mechanisms of the practical arrangements for check into the way in which is carried out of the predictions.

Human and the idea of privacy are ideas obtained in the social context and therefore have some plasticity. The way in which our beliefs will develop these matters will shape the way in which we will limit or not our profiling technologies.

It may not be possible to predict which will be the consequences of this significant jump in consumer profiling. Some of the things we will find will need regulation, others not. Many of those with the highest dangerous potential will remain in the shadows until their effects will be generated. They are in the same category with "we do not know that we do not know." Even if at this moment we are not aware of an immediate threat this is not equivalent to the fact that it does not exist.

As stated above there are a number of negative reactions which in a brief analysis do not seem justified. However, it is possible that this could be one of those situations when the public opinion reaction proves wise. Because in an uncharted territory the only thing that matters is the stake. Public opinion consciously or less consciously knows this. Maybe our brief calculations seem right, but limiting the stake of a bet even when the consequences seem less probable is not an irrational attitude.

If our cognitive functions are the most important processes which define us, making possible all we have, maybe it is a good idea to be cautious in categorizing them, interpreting them or trying to modify them. The fact that our mind adapted until now to any change is not equivalent with future adaptations to any future change.

The rate of change seems to me very important. We may not be able to have an understanding of the game we play. But perhaps we can bet in such a way to avoid impossible situations. The fact that we cannot imagine now how those situations could look like does not mean that they will not exist. The trick of the mind in this case is against us. Offering scenarios for exemplifications (inaccurate or false predictions caused by computers, interpretations, theories, but also by the negative influences that may occur with the deep understanding of the choice mechanisms) and if these examples do not persuade automatically are inclined to believe that there is no threat. And so we are discovered more than ever. The limit of our imagination is not the limit of the possible.

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Chapter 11
Ethical Dilemmas of Future Technologies

Ana Maria Iorga and Nicolae Al. Pop

11.1 Introduction

Humanity has always been on a quest to find immortality writers of old created beautiful masterpieces where they depict their heroes' struggles and sacrifices endured on their journey to transcend their mortal state. Throughout the centuries, anonymous or collective writers have bequeathed legends like *The Epic of Gilgamesh* or *King Arthur and the Knights of the Round table*, in which the main characters' drive is their search for immortality or the Holy Grail. In some instances, immortality was seen as a punishment, like in Greek mythology, where mortals were punished by Gods to endure neverending chores—Sisyphus, who was punished to push a boulder up the hill just to have the boulder run down the hill each night.

In modern literature we find a similar interest in achieving immortality, both in children's books, like *Harry Potter*, and other tales like *Lord of the Rings* and all of the recent vampire-centered literature and movies. Besides immortality, another theme that is heavily exploited is that of humans with superpowers—either Superheroes or mutants. Since 1938, with the introduction of Superman, comic books represented the favorite genre to introduce superheroes and talk about ethical or social issues in an informal way. They addressed concerns that stemmed from World War II and the Cold War, employing a science-fiction approach. Comic books tackled stringent moral issues and hot social or political situations by using symbolism that went deeper than the superficial, first-hand read. One of the most

A.M. Iorga (✉)
Bucharest University of Economic Studies, Bucharest, Romania

Buyer Brain, Bucharest, Romania
e-mail: ana@buyerbrain.com

N.A. Pop
Bucharest University of Economic Studies, Bucharest, Romania
e-mail: nicolae_al_pop@yahoo.com

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influential series was Marvel's X-Men that addressed issues like human rights, tolerance towards those that are different (when different meant having superpowers) and the ethical issues raised by morphing humans with machines and thus achieving unlimited power.

It is this desire to perpetuate ourselves forever that constitutes the basis of human achievement and civilization as we know it (Cave 2012). And it is also the drive that keeps us pushing forward to develop technologies and tools that give us more power to control natural and biological phenomena related to aging and death.

In 1965, Gordon Moore, co-founder of Intel, stated that computers' processing power will double every 24 months. This empirical observation was adopted by the electronic industry as a de facto law and it became known as Moore's law (Moore 1965, 1998). Companies strived to achieve that target and industry-regulating bodies launched roadmaps that laid out the expected accomplishments needed in order to achieve Moore's law.

This fostered innovation and acted as a catalyst to the rapid development of all the industries that constitute the basis of our modern world, such as health care, transportation, education, and communication. It has significantly altered the way we communicate, work, and rest. In other words, our whole life has been shaped on the basis of technological development.

Although we take technological advancement for granted, we are still to grasp the speed at which it takes place and the implications it will have on our society and daily lives. That is because, according to Ray Kurzweil, humans are linear and technology is exponential (Kurzweil 2004). We tend to view technological advancements using our common sense "intuitive linear" perspective; therefore we miss the fact that the technological advancement that took place in the nineteenth century was greater than all the changes that took place in the preceding nine centuries (Diamandis 2016). The author also notes that in the first 20 years of the twentieth century there were more advancements than during the entire nineteenth century.

At the core of Kurzweil's theory stays the *Law of Accelerating Returns* that was first proposed in his book "The Age of Spiritual Machines" (Kurzweil 1999). In a nutshell, the law states that an evolutionary process progresses at an exponential rate and that its returns (e.g., computational power, decrease in size) follow a similar pattern. Even more, once a process becomes more effective, there are more resources poured in improving that process, which leads to another level of exponential growth. That eventually leads to an exponential growth of the initial exponential growth, which explains why technology keeps evolving at such a rapid pace. He also believes that when a process reaches its end, meaning it cannot expand further, there will be a paradigm shift and another process will appear that will maintain the exponential growth in that field.

It wasn't until the last couple of years that technology registered actual progress into making the illusory quests for achieving superpowers or immortality become reality. Scientists have created DNA nanobots that could enter the bloodstream and recognize and interact with cancerous molecules in the body (Bachelet 2014; Amir et al. 2014; Douglas et al. 2012). Once they identified a diseased molecule, the nanobots would flood a cocktail of strong drugs that would kill the sick cells. This

technology is promising not only for treatment but also for imagery and diagnostic purposes (Han et al. 2011; Cavalcanti et al. 2007), which plays a key role in prescribing the right treatment. There are already 12 types of cancer that can be detected using this technology and scientists are confident that the solution will expand to treat other diseases.

Kurzweil and other futurologists claim that these technologies will allow people to continuously improve their bodies and thus live forever. And Kurzweil believes that this will be attained during his lifetime, by 2030. He said in an interview that "… (by) 2030 we'll be putting millions of nanobots inside our bodies to augment our immune system, to basically wipe out disease" (Kurzweil 2013).

Another trend, called body/brain enhancement, predicates on the benefits that humans will achieve by morphing with a machine. We grew up with technology being an external aide but with the advancement of the latest chips and nanobots, technology will increasingly become part of our bodies.

Take the case of Oscar Pistorius, a South-African athlete that was born with a congenital bilateral absence of the fibula. His legs were both amputated when he was 11 months old. Nevertheless, he trained in various sports and in 2004 started running, which changed his life. He is the first double amputee to compete in an Olympic Games race (Klemko 2012). His motto was "You're not disabled by the disabilities you have, you are able by the abilities you have" (Davies 2007).

Dubbed "Blade Runner" (Yahoo! Finance 2007) or "the fastest man with no legs" (BBC News 2007), he was ranked as the 15th fastest runner in the world (Yahoo! Finance 2007) after finishing second in the competition against able-bodied athletes in Rome. His performance spurred controversies around the fact that his blades gave him an unfair advantage over able-bodied runners, whose feet were made out of flesh and blood rather than carbon composite. The main complains were related to the fact that Oscar's blades allowed him to take larger strides, that were impossible for human runners (BBC News 2007) and that his legs were not subject to metabolic processes, like the accumulation of lactic acid, that were responsible for fatigue onset and decreasing the overall performance. Due to these concerns, in 2006 the International Association of Athletics Federation, or IAAF, has amended its competition rules and banned "the use of any technical device that incorporates springs, wheels, or any other element that provides the user with an advantage over another athlete not using such a device" (Yahoo! Finance 2011). Following these concerns, Oscar was tested in Cologne along with five other able-body athletes and the results were staggering. Professor Brüggemann from the German Sport University in Cologne concluded that the prosthetic limbs gave Oscar a clear advantage over natural-legged athletes, because the blades required 25 % percent less energy from the body in order to maintain the same speed. Furthermore, the energy loss in the prosthetic limb was 30 % less than that in the ankle joint of natural athletes (IAAF 2008). Nevertheless, the athlete reacted to the IAAF ban and sought legal action, claiming that there was no reason he shouldn't be granted the right to compete in the "normal" Olympics Game and that he was being discriminated against. He eventually won his case and the IAAF was forced to revoke its decision. Oscar qualified for the 2012 Summer Olympic Games where

he ran in the 400×400 m relay race together with the South African team. Unfortunately, Oscar's promising athletic career was suddenly terminated where he was convicted of murdering his girlfriend.

The development of computing and IT has had a definitive impact on the capacity to process information. External devices support and enhance human cognition beyond the capacity of biological brains. Software can also be considered as a cognition-enhancing environment, as it stores a high amount of data in its working memory, executes routine tasks, and displays information (Bostrom and Sandberg 2009). Some consider the internet and email to probably be the most powerful cognitive enhancing pieces of software. Their power stems from the fact that they enable people to connect with each other and share their wisdom in order to achieve a specific purpose (Surowiecki 2004). The system becomes more powerful as more people interact through those platforms (Drexler 1991). Furthermore, research has shown that computers and information technology have a positive and significant impact upon productivity by enhancing human capital (Brynjolfsson and Hitt 1998; Brynjolfsson and Yang 1996; Stiroh 2001).

Technology doesn't necessarily mean silicon transistors; it can also be a pill that enhances different functions of our body. Modafinil, for example, is a smart drug that has been used in the treatment of narcolepsy (Battleday and Brem 2015; Morgenthaler et al. 2007; Zee et al. 2013) and has been cleared by the FDA to be used on healthy people (FDA 2015). Some of the benefits of the drug are improved working memory and task performance as well as attention (Müller et al. 2013). Its side effects such as temporarily reduced creativity (Mohamed 2014) and some kind of mild rash are not considered severe.

One of the ethical issues raised by the usage of smart drugs comes from the fact that, given their reduced side effects, people will be inclined to consume and abuse them on a larger scale. And once a critical mass of people from a group (university class or work colleagues) starts using these nootropics on a regular basis, there will be an informal pressure on those not taking these pills to start using them, in order to keep up with the results of their peers. This is a form of coercion. In an ultra-competitive work or school environment, with a "winner takes all" mentality, this coercion could be intrinsic, where one willingly appeals to these helpers in order to keep pace (Chatterjee 2004). Given that this drug and other similar nootropics are rather new and that not enough clinical studies have been done to assess the long-term consequences of their side effects (Smith and Farah 2011), users are subjecting themselves to potential risks that might outweigh the short-term benefits.

The other form of coercion is extrinsic, where peers or superiors demand the same high performance from a person that is not on these drugs compared to those that are. For example, Modafinil has been shown to increase performance in military pilots. Should all pilots be required to take similar drugs before they fly just so that they are in their best state? What about those on commercial airlines? Can we, as consumers, demand that pilots take those type of pills, ensuring they are as alert and intelligent as possible?

Furthermore, these drugs are not currently regulated by universities or other regulatory bodies. Several informal surveys in the USA and the UK have shown that

their prevalence is higher at elite academic, affluent universities, especially among top performing students (Cadwalladr 2015). Interestingly enough, nobody seems to have any problem with these pills. Students consider them to be "study pills" and not at all drugs. While interviewed universities prefer to turn a blind eye to this issue, as they lack the proper application norms.

Older drugs also used as cognitive enhancers, like Adderall (an amphetamine) or Ritalin (methylphenidate), that are currently prescribed for the treatment of ADHD, have been studied more extensively and it has been found that they pose a high risk for abuse, perhaps leading to dependence (Smith and Farah 2011). Therefore, they are banned for athletes and are not intended for healthy people.

Caffeine and nicotine are probably the most abused of the cognitive enhancers that are widely accepted for mass usage (Molyneux 2004). Although nicotine is known to be highly addictive, there are no ethical debates concerning the use of these substances. So then, one may ask, why is it ethically acceptable to achieve success by using these enhancers whereas achieving the same results by using smart drugs is considered unethical? Is Modafinil considered to be a shortcut to success whereas coffee or nicotine are rightful helpers to hard work? There are neuroscientists that claim that taking Modafinil has the same effect on the body as drinking coffee (Chan and Harris 2006). If we agree that smart work is better than hard work in the quest for achieving success, why can't we consider that smart drugs represent "smart work"? Does the fact that there are no serious known-of side effects to Modafinil, for example, make it more ethical to use compared to amphetamines? For a more detailed discussion on the ethical issues raised by the usage of smart drugs, the reader can check the works of Farah et al. (2004), Greely et al. (2008), and Miller (2010).

Let us revisit Pistorius's case. He was born with a congenital deficiency that made it impossible for him to walk, let alone run. Therefore, he needed his prosthetic limbs in order to be able to live a "normal" life, allowing him to enjoy the freedom that his healthy friends had. Thus, his blades fulfilled a therapeutical role initially. Now, the fact that those blades were designed by a renowned American prosthetists and were produced by a leading manufacturer allowed him to run with them and achieve spectacular results in the Paralympic games, breaking record after record. As his running time was close to those recorded by healthy athletes, he requested the right to compete with them. The leading British athlete, Tim Benjamin, supported Pistorius's quest to compete at the Olympics despite him having a proven advantage over able-bodied runners. At the time, Tim Benjamin commented "If you do the standard, I don't see why you can't compete at world or Olympic level" (Knight 2007). Oscar was fighting as hard as the others to make it in the Olympics, so why discriminate against him? Let's assume, for the sake of the argument, that Oscar had won an Olympic title, competing against healthy athletes. This scenario is not far fetched, as Oscar was ranked as the 15th fastest runner in the world. People would justly praise Oscar for his ability to transcend his condition and disease and be able to achieve some of the highest distinctions in his field. He would become a role model for all athletes, both healthy or with special needs.

Now, let's assume that through hard work and the advantage of running on bionic legs, Oscar snatched title after title, giving the other "normal" runners little or no chance at all. What would their options be? Should they amputate their normal legs and move on to bionic limbs, in order to be able to compete with him? Is it ethical to put pressure on healthy people to enhance themselves in order to be able to have a chance to win against a bionic person? Until Oscar joined the group, those athletes were competing on an even playing field, natural-endowment basis, and none of them had any external advantage.

If one of the healthy athletes decided to amputate his legs and get prosthesis, how would the other Olympians react? How would the media and general population accept a sportsman's decision to mutilate himself in order to achieve greater performance? The point to be made is the following: if the enhancement is required by a medical condition, being therefore viewed as a treatment, and the improved performance comes as a secondary effect, then we don't seem to have any ethical issue with the enhanced performance. But, if a healthy person decides to modify his body in order to increase his output, then we start raising our eyebrows. Who decides what represents optimum performance and where is the boundary between treatment and enhancement?

A very common approach used to define the boundaries between what is considered to have a therapeutical or enhancement effect consists in applying the concept of "natural" or "normal" when describing the outcome of various interventions. In that light, the intervention that restores a human being to the "normal" state is considered treatment whereas anything that goes beyond that line falls in the enhancement bucket. This approach raises several valid questions—how do we know that today's "normal" will also be considered normal in the future? Is it ethical to apply a generally accepted standard to the whole population? Do all people have the same baseline to which we can compare their abilities? What about in 10 years, will the baseline stay the same as today?

In 1954, the medical student/athlete, Roger Bannister, broke the 4-min mile, a standard that was previously considered unbreakable. At that time, researchers were firmly convinced that it was impossible for the human body to run a mile under 4 min. The existing record was 4:01.4 min per mile and had been held since 1940, with the firm conviction that it represented the limit of the human body. Nevertheless, Bannister started training towards breaking that standard and he managed to run a mile in 3:59.4 at an Oxford race in 1954. Immediately after his record, another athlete, Australian John Landy, broke Roger's record by more than 1 s, running a mile in 3:58.0 (Winters 2004). Since then, the bar kept going down and nowadays the outstanding record is 3:43.13, established in 1999. The point here is that the generally accepted "normal," the standard that we use to measure everybody against should not be viewed as an absolute, unmovable value.

Therefore, when we assess an individual's performance, be it physical or cognitive, how do we establish the norm? Is it based on whether we decide a particular intervention is considered a treatment or an enhancement? Many of the technologies that are nowadays used for enhancement purposes stemmed from research that attempted to cure certain diseases. As they initially had a therapeutical purpose, it is

mainly the recipient of the technology that assigns the "enhancement/therapy" label (Nielsen 2011). Billions of dollars are invested each year in R&D by pharmaceutical companies in a quest to find new molecules and develop new technologies that will cure existing diseases. These technologies, once cleared by regulators, find other uses in improving the lives of healthy people.

Julian Savulescu, Uehiro Professor of Practical Ethics at the University of Oxford, considers that the medical treatment is a subclass of enhancement or improvement, because the ultimate goal of treatment is to improve patients' health and quality of life. He argues that, under the welfarist approach, enhancement is desirable because it contributes to the well-being of a person (Savulescu et al. 2011). The welfarist definition of enhancement—"Any change in the biology or psychology of a person which increases the chances of leading a good life in the relevant set of circumstances"—doesn't discriminate between medical therapy and enhancement. Savulescu argues that if a sick person is encouraged to improve his state by the use of various physical or cognitive therapies, a healthy person should also be allowed to improve his well-being by resorting to similar methods.

He takes his argument even further, building the case that doping should be legal in sporting competitions. Under the current rules, sport is a genetic lottery and it discriminates against those that are not naturally endowed (Savulescu et al. 2004). Doping, on the other hand, would level the playing field, by allowing those that are not so able to increase their performance. Is it fair that some athletes have a genetic advantage over others asks Savulescu? Or why are classical musicians allowed to take drugs before a performance and nobody looks down on them for doing so? Research performed by Brantigan et al. (1982) showed that beta-blockers improved the musical performance of musicians that used those drugs.

While in professional sports the usage of drugs is highly regulated, things are considerably more complicated when it comes to real life. As discussed above, nootropics are used on a large scale, especially by young adults from Ivy League universities and in Silicon Valley. The more competitive the environment and the higher the expected reward, the higher the pressure to resort to cognitive enhancers in order to boost performance. Especially as the field is not clearly regulated and, except for amphetamines, there are no penalties for using those drugs. Furthermore, due to the fact that side effects are mild and relatively unknown, there is a high incentive to abuse the drug in the quest for even higher performance.

Our belief is that, unless there is some regrettable casualties related to the use of cognitive enhancers, consumption will remain unregulated in the future. That was the case with anti-doping regulations in the Olympic competitions. In the 1950s, athletes started taking amphetamines that had by then been used by soldiers in WWII (Noakes 2004). It wasn't until 10 years later that the first athlete died during the 1960 Summer Olympics in Rome due to doping. It took another 7 years, when a second cyclist died during the Tour of France, before the International Olympic Committee established a Commission to enact anti-doping measures. The first mandatory drug test was performed in 1968 at the Winter Olympic Games in Grenoble, France (Verroken and Mottram 2005).

Therefore, in the absence of regulations and severe side effects, there will be increasing pressure upon people to turn to different kinds of enhancement. As the performance of those that are enhanced increases and they start to enjoy benefits that they didn't have before, more and more "regular" people will feel that they are at a disadvantage. And, if the risks are low, why shouldn't they try it too? After all, who wouldn't want to become smarter, if all that they had to do was take a small, inoffensive pill?

There is an ongoing debate about whether a high IQ is a predictor of a successful life. As Thomas Gray once said "Ignorance is bliss," (Gray 1747) indeed much of popular culture depicts geniuses as being cursed to be lonely and unhappy. Nevertheless, studies show that intelligence is "the most powerful single predictor of overall job performance" (Gottfredson 1997). IQ is considered to have a Gaussian distribution in the general population, with the median score of 100. About 93 % of the population falls in the 70–130 range, with 5 % of the population measuring above 125 and 5 % under 75 (Neisser 1997; Hunt 2011). Therefore, an IQ under 70 might be classified as a disability while lower scores might have an even stronger negative impact upon a person's achievements and quality of life. Let's assume that there is a cognitive enhancement pill on the market that increases the IQ by approximately 10 points and has negligible side effects. Under the treatment/enhancement paradigm discussed above, it could be compulsory to offer this pill to those with an IQ under 70, so that they are restored to the "normal" score in the population. But what if a student wants to become a medical doctor or wants to major in advanced mathematics? A 10-point increase in his IQ will make his dream more attainable and will also increase his quality of life during his studies, regardless of his natural IQ score. Therefore, under the welfarist approach, he is as entitled to receive said medication as the guy that has a below-average IQ.

Another heated debate is that of talent versus practice. On one hand, we have the highly successful writings of Malcom Gladwell (2008) who states that "Practice isn't the thing you do once you're good. It's the thing you do that makes you good" or Colvin (2008) who argues that talent is overrated and that hard work is the key to world-class performance. This view was well accepted by mass media and the public at large, as it satisfies our sense of fairness: no matter how talented one is, through hard work one can become anything in life. Though it is true that performance cannot be achieved without practice, decades of research show that innate abilities, which we call talent, have a significant contribution to performance. And this contribution is not overtaken by practice. In other words, given two highly trained musicians, that put in the same amount of practice, the one that is more talented will have a better performance than the other one. This was the conclusion of a study done by two psychologists, David Hambrick, associate professor at Michigan State University, and Elizabeth Meinz, associate professor at Southern Illinois University Edwardsville. They studied the impact of working memory capacity on musical performance.

Working memory capacity refers to the ability of storing and processing information simultaneously (Hambrick and Meinz 2011). Previous research has shown that there was a strong correlation between working memory capacity and decision

making, problem solving, language apprehension, abstract reasoning and learning (Hambrick 2005). Working memory capacity is influenced 50 % by genetic factors (Kremen et al. 2007) and it is also strongly correlated with intelligence (Kane et al. 2004; Kyllonen 1996). Meinz and Hambrick studied 57 pianists that varied widely in terms of the number of practice hours (from 260 h to more than 31,000) and tested them on sight-reading, which is playing a song for the first time. They found out that the amount of practice accounted for around 50 % of the total variance in the task and that working memory capacity had a statistically significant contribution of around 7 % to the overall performance (Meinz and Hambrick 2010). Moreover, researchers found no evidence that voluntary practice would reduce the incremental contribution. Therefore, the theories proclaimed by Gladwell and Colvin in their writings are debunked by science. As one of the authors says "(it is not) impossible for a person with an average IQ to, say, earn a Ph.D. in physics. It's just unlikely, relatively speaking. Sometimes the story that science tells us isn't the story we want to hear" (Meinz and Hambrick 2011).

If hard work alone isn't enough to make up for a lack of talent is the world discriminating against us?

Furthermore, research shows that after reaching the age of 40, our memory starts to deteriorate, leaving all of us a bit cognitively disabled (Savulescu et al. 2011). But cognitive enhancement holds the promise it can empower us to overcome our disabilities or lack of talent. Modafinil, for example, has been found to improve the memory component associated with visual pattern recognition, reaction time and working memory in healthy subjects, especially when solving more difficult tasks and among lower-performers (Müller et al. 2004; Turner et al. 2003). The drug was initially developed to treat narcolepsy and in healthy people it was found to reduce the drop in performance due to lack of sleep. It also improves attention and working memory in sleep-deprived aviators (Caldwell et al. 2000) and doctors (Gill et al. 2006) without serious side effects and without increasing the risk of dependency (Myrick et al. 2004). Sooner or later this type of cosmetic neurology will become widespread and mass adopted, just as happened with cosmetic surgery (Chatterjee 2004).

We want to bring into discussion several aspects that derive from the arguments presented above. Firstly, in the not so distant future, humans will be able to undertake some major changes that will affect their everyday lives and needs as we know them. They will be able to improve their performance beyond their natural-born capabilities, will alter their needs and pains, and will exhibit behaviors different from those of their unenhanced peers. As more and more people opt for an enhanced lifestyle, there will be increasing pressure on those not enhanced to use these practices if they don't want left behind. How do we ensure that we create an environment where people are equally free to choose whether they want to be enhanced or not? Another issue is related to the affordability of those drugs. If only the rich can afford them, then "the rich get smarter and the smart rich get richer" (Sandberg and Savulescu 2011) thus further increasing social division and inequality.

As people start to change their behavior based on the new traits that they have developed, they will slowly but surely turn into a new consumer breed, with dif-

ferent expectations from their "plain," unenhanced human counterparts. As they grow in numbers and their buying power grows, companies will need to pay attention to these new customers and devise new products and communication strategies for them.

With the advancement of technology and the internet, people are more connected and they can interact more easily with each other. Furthermore, they have access to goods or services from all over the world and they don't have to be present physically in a certain place in order to receive those goods or services or to interact with people from those places. The internet plays a major role in this shift, as it is the platform that allows people to connect and empowers them to take the initiative. They can buy or sell their stuff to anyone in the world with minimum hassle.

This degree of connectivity and accessibility has produced a shift in perception and attitudes towards ownership, especially in the young population. Ownership is a basic human right that is protected in the Universal Declaration of Human Rights. Article 17 states that "Everyone has the right to own property." But young consumers, Millennials and Generation Z, have developed a different attitude towards ownership. Increasingly, they are more likely to pay for access and less likely to bear the cost of ownership. The new trend was dubbed "Freedom from Ownership" and it affects all categories of products, from housing to cars, electronics and even clothing. It is clear to see how this shift in behavior can have an impact on the economy.

As stated above, technology and the internet are among the most powerful cognitive enhancers. They've managed to change attitudes towards one of the basic human needs in just one generation. With technological empowerment, Millennials and their younger siblings have started to develop different needs compared to their parents and their priorities have changed. This can also be seen in their attitude towards work. According to a study commissioned by Bentley University, around 67 % of Millennials want to start their own business, with 37 % of them wanting to work on their own, without having other employees (Bentley University 2014). This shows that the younger population values flexible schedules and an autonomous lifestyle more than advancing their careers in the corporate world. Furthermore, 70 % of Generation Z hold entrepreneurial jobs, because the internet allows them to introduce their offer to the entire world (Johnson 2015).

Considering technology induced such profound changes in just one generation, we can argue that other types of enhancement may also trigger perception and attitude changes within younger generations. Especially as medical cognitive or body enhancers enable people to develop abilities that were normally outside of their range—be it a better memory, increased productivity due to higher focus and less need to sleep or better physical performance.

Secondly, if we agree that enhancement is considered to have a positive influence on peoples' lives, as it improves their performance and quality of life, then we might argue that it is the state's duty to ensure that its citizens have access to means for enhancement. There are numerous studies that found correlations between a higher level of intelligence and health promotion (Batty et al. 2007; Whalley and Deary 2001) or the reduction of certain economic and socially negative events (Gottfredson 1997, 2004). That is probably explained by the fact that higher cognitive power

makes people more likely to pursue an education and have access to better jobs and less likely to be manipulated and vulnerable. Nevertheless, studies failed to find a correlation between the level of intelligence and that of happiness (Sigelman 1981; Hartog and Oosterbeek 1998; Gow et al. 2005).

Since the signing of the Universal Declaration of Human Rights in 1948, it is unanimously agreed that access to health care is a basic human right. Although the interpretation and application of the principle varies from country to country, governments must provide their citizens with universal access to good quality health care through a reasonably developed infrastructure that ensures that medical services are available to all communities, regardless of geographical areas. Governments are continuously devising public health care campaigns that aim to inform the population about health risks such as antismoking or antiobesity campaigns or aim to promote a healthier lifestyle with campaigns that increase awareness of vaccination, disease and illness prevention, and the benefits of sports. Therefore, if there were a pill or methodology that provided people with significant benefits in terms of personal health or performance and if that drug or procedure was shown to be safe, would that qualify them to be included in the medical toolbox? If yes, and if they have been cleared to be used by healthy people too, in order to enhance peoples' performance and improve their quality of life, then we can argue that healthy people also have the right to access those drugs or procedures, in order to increase their well-being.

If we go one step further in our judgment, we can argue that a state would benefit from having smarter citizens. As discussed above, research shows that higher intelligence is correlated with higher personal, economic, and social benefits. A study performed by Herrnstein and Murray (1994) looked at the impact of a 3-point increase in the IQ of the general population and they found that the increase would be responsible for a 25 % drop in poverty and male incarceration rate, 28 % decrease in high school dropouts, and 15 % drop in illegitimate births. Even if it is hard to measure the direct impact of these changes on the country's economic performance, it is evident how they would positively impact society as a whole. Furthermore, there were studies that tried to correlate countries' average IQ score with their GDP, but the results were not conclusive, due to lack of accurate data regarding the IQ of a high number of countries. Nevertheless, research shows that a 1 point IQ equals a 0.11 % increase in GDP (Jones and Schneider 2006).

Our objective in this chapter was to raise questions regarding the challenge of ethical and moral principles and values by the rapid development of technology. As shown in the beginning of the chapter, technology grows exponentially and it induces fundamental changes in consumer behavior, attitudes, and perceptions. Ethics needs to keep pace with this rapid technological development, because the ethical issues raised are becoming increasingly more complex. Technology is not neutral, as it is designed to change the interaction between humans and the environment and between humans themselves. It may happen that some of the new behavioral changes might challenge or violate certain values, social norms, or even laws. Thus, it is critical that ethical issues should be discussed upfront and regulations should be put in place. Otherwise, the industries affected by the emergent technolo-

gies might end up like the cognitive enhancement pills industry: poorly regulated and easily abused.

In the context of market research, the field will also be changed by these emergent technologies. There is already a heated debate about the future of market research and some predict the death of the industry, as we know it. In an article published in 2015 in Research World, ESOMAR's magazine, authors Michael and Mavros argue that the companies that will not adapt, will shut their doors. They also believe that in the future data scientists will play a more important role in providing insights, because of their use of predictive algorithms (Michael and Mavros 2015). That is a major shift from traditional, mainly survey-based research, that usually takes a snapshot of the present situation or delivers insights based on past reactions. Neuromarketing research, which relies on brain recorded data, has been shown to have a higher predictive value of behavior than self-reports (Pavlou et al. 2007). For example, cooperation is predicted by the activation of the caudate nucleus (Delgado et al. 2005) while rejection is usually preceded by insula activation (Sanfey et al. 2003). Furthermore, brain patterns linked to trust or distrust are a better predictor of price premiums than the respective self-reported results (Dimoka 2010).

The future or market research lies in the realm of technology, where data will be passively collected from people, without asking them for their opinion. The Internet of Things, big data, brain scans, wearables, and biometrics will become the name of the game. Although these technologies are not yet used at their full capacity, they have started to pose serious ethical and security issues. With the potential empowerment brought by brain and body enhancers just how far away are we from some of our favorite science fiction characters? We might not yet be able to jump over buildings in a single bound but the fantasy worlds of X-Men and Lucy are not just products of our imagination anymore.

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Chapter 12
The Ethics of Neuromarketing in Sports

Gregory Dumont

> When it comes to sports, it may not be the last place to find an attention focused consumer, but it's close. What really matters more is that people will always watch live sports and they'll engage with their friends and other fans unlike any other activity. (Edward Gold, Advertising Director—State Farm)

The global sports industry is valued at USD1.5 trillion, which is roughly the size of the world's tenth largest economy—Canada (Statistics Times 2016). The sports industry in the United States is valued at roughly USD498.4 billion. Domestic spending on sports advertising is estimated at USD34.9 billion or approximately 6 % of projected global advertising spend in 2015 (Plunkett Research 2016). Sports brands compete for consumer discretionary spending within the broader "entertainment" category, which represents 5.6 % or USD2827 of annual household spending in the United States. Average annual spending on entertainment is outpaced by only housing (33.9 % or USD17,115), transportation (17 % or USD8583), food (12.8 % or USD6462), insurance-pension (11.1 % or USD5604), and healthcare (5.9 % or USD2979) (Wesley 2016).

Despite the data suggesting that the average US household spends less than 6 % of total income on entertainment pursuits, sports brands have a singular and highly coveted asset that few, if any, other product or service providers have—fans. What is the difference between a customer and a fan? Fans are impassioned brand evangelists who paint their faces (Mooney and White 2014), tattoo their bodies, and spend disproportionately large sums of money on branded merchandise to highlight their emotionally charged co-identity with the sports brand. In 2014, 168.9 million adult Americans, roughly 70 % of the adult population, identify themselves as sports fans (Perform Group 2014). The indelible passion underlying the relationship between sports fans and sports brands portend two unique revenue opportunities not

G. Dumont (✉)
Plymouth State University, Plymouth, NH, USA
e-mail: gdumont@mail.plymouth.edu

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currently enjoyed by other product, service, or experience providers—TV broadcasting and corporate sponsorship.

In America, leisure activities account for roughly 5 h of our day. Time spent watching TV occupies more than half of our leisure time at 2.8 h per day. Socializing and communicating, each of which is integral to the deep bond underlying sports fan loyalty, represent the second most popular leisure pursuit in the US @ 38 min per day (US Department of Labor 2015). Of all primetime TV programming genres, sports ranks only eight with the broader US viewership preferring sitcoms, movies, and reality programming (Statista 2015). That said, the sports experience is unique because it is only available in—stadium or through live TV (not available on Netflix or competing internet-based cable alternatives). Additionally, sports fan are the most highly involved and deeply engaged viewership of all media programming genres. On average, adult sports fans in the United States spend 7.7 h consuming sports with 52 % and 94 % consuming sports experiences through attendance at live events and watching television, respectively (Perform Group 2014).

Accordingly, the price of TV broadcasting rights for sports has risen exponentially with league contracts for the NCAA (USD11 billion), NLF (USD5.9 billion), MLB (USD1.6 billion), NBA (USD930 billion), Olympics (USD907 million), NASCAR (USD745 million), PGA (USD712 million), and NHL (USD201 million) representing USD21,995 billion collectively. It should be noted that these figures include neither regional sports network deals nor broadcasting rights negotiated on behalf of college conferences (Smith 2014). Sports programming now accounts for roughly 37 % of broadcast TV advertising spend. The "Big Four" networks (ABC, CBS, NBC, and FOX) generate USD8.47 billion in sport-generated advertising revenue, which represents a 35 % increase over 2010 figures (Crupi 2015). Companies of all sizes seeking to subvert the clutter of traditional advertising have also sought differentiation by linking their proprietary corporate brand with highly revered sports brands through sponsorship.

Sponsorship represents a cash and/or in-kind fee paid to a property in return for access to the exploitable commercial potential associated with that property. Sports sponsorship opportunities, particularly exclusive partnerships, offer brands the unique opportunity to become part of the fabric of the sports property, the event and each unique fan experience through permission-based, two-way engagement (Belzer 2013). Global sponsorship spending in 2015 was estimated at USD57.5 billion with US sponsorship spending representing roughly 37 % of global spending at USD21.4 billion. Sport-related sponsorship spending accounts for USD14.98 billion or 70 % of all sponsorship spending in the United States (IEG 2015).

The scale and scope of the sports industry and relative interdependence of sports brands, media partners and corporate sponsors underscore the many reasons why marketers are eager to better understand how *the marketing* of *sports branded experiences* and *non-sports branded experiences marketed* through *sports channels* can better resonate within the mind of sports fans (Shank 2005). The relationship that binds sports fan and sports brands is often irrational, aspirational, and emotionally driven. Accordingly, this analysis will explore the *potential* commercial promise

and/or perilous ethical considerations of neuromarketing and data mining in sports. Neuromarketing is the study of brand familiarity and product preference in the brains of consumers exposed to advertising and marketing stimuli (Madan 2010). There is no evidence of existing empirical or experimental neuromarketing research focused on the connection between sports fans and sports brands. The overwhelming popularity of sports coupled with evidence that sports brands are investing in next generation venues filled with multisensory technology leads to one question—can sports marketers expose a "buy button" in the mind of sports fans?

12.1 A New Consumer Marketplace Driven by Branded Experiences

Consumer markets have long been characterized as either product or service-oriented, with the primary difference resting on the relative degree of brand tangibility. This antiquated dualistic framework of markets is evolving to recognize that consumers don't simply buy products and service. Rather, consumers choose amongst competing "branded experiences" that are believed to deliver the greatest benefits, utility and/or value. While companies, sporting firms included, remain responsible for cultivating relevant brands, emotionally driven attitudes and judgments of branded experiences ultimately reside deep within the subconscious mind of current and prospective consumers—in our case, sports fans. Our desire to better understand the complex neural network underlying consumer choice has spawned a new discipline, neuroscience, an umbrella under which neuromarketing resides. Industry and brand managers recognize neuromarketing as the most promising methodological approach to opening the "black box" of consumer choice.

The brain is unilaterally recognized as the "most complex structure in our universe" given its responsibility for moderating our processing of sensory stimuli and emotional triggers into behavioral response. Traditional approaches to consumer research (i.e., focus groups, surveys) remain flawed by a host of biases that inhibit consumers' ability to articulate how they truly feel about branded marketing stimuli (Morin 2011). Global brands are estimated to spend upwards of USD592.43 billion on advertising in 2015 (Media Buying 2014) with the average consumer exposed to more than 5000 branded messages per day. Accordingly, marketers are enthusiastic about the potential that neuroimaging technology (i.e., MEG, EEG, and fMRI) will better inform branded efforts aimed at delivering an emotionally compelling and highly personalized marketing exchange (Lee et al. 2007).

Opponents of neuromarketing, largely within the academic community, are focused on the potential neuro-ethical implications of this fledgling research methodology. Challengers of the research orthodoxy of neuromarketing assert that (1) the fundamental objective of marketing, as a discipline, is to manipulate consumers into buying things they may neither need nor want and (2) neuroimaging technology

representing the first true threat to consumer autonomy and/or "free will"—undetected commercial manipulation of consumer choice (Murphy et al. 2008). In addition to ethical concerns surrounding the potential identification of a "buy button" in the brain, opponents of neuromarketing research also cite the protection of research subjects and ownership of the data gleaned from neuromarketing studies as ethical challenges. The divergent views proffered by proponent and opponents of neuromarketing practices are largely based on one's predisposition to assume consumers are "rational" actors.

12.2 Sports Brand Experiences, Econs, and Consumer Rationality

Neoclassical economic theory and rational choice models assert (1) sports markets must be efficient as a result of the equilibrium conditions underlying supply and demand and (2) sports fans are cold, conscious, rational, and deliberative optimizers capable of evaluating competing branded experiences solely on the basis of "absolute utility" or "pleasure units" derived from an exchange (Ariely 2008). Economic theory further assumes that all sports fans are unbiased, unemotional, dismissive of sunk costs, never lacking in self-control, and highly capable of calculating/comparing the myriad of opportunity costs underlying the consistent selection of optimal resource allocation. The consumer avatar constructed through economic theory and rational choice models assume that *Homo sapiens* have been replaced by fictional creatures called Homo Economicus—Econs for short.

Sports fans, acting as Econs, are thought to evaluate all branded experience alternatives through the lens of acquisition utility. Using sophisticated mental accounting techniques, sports fans would only engage in those branded experiences that delivery the greatest consumer surplus—utility gained from acquiring a branded experience less the opportunity costs (both time and money) of foregone branded experiences (Thaler 2015). Any deviation from the optimal path of action, as a result of "irrational" mistakes, would otherwise not be repeated as a result of "consumer learning" (Ariely 2008). Acting as Econs characterized by unbounded self-interest, unbounded willpower, and unbounded computational capacity (Lekachman 1959), sports fans would be paralyzed by the mental accounting required to compare the infinite ways to "best spend" USD4871—the average price of a ticket for Super Bowl 50 between the Denver Broncos and the Carolina Panthers (Isidore 2016).

In a marketplace made up of mythical Econs, ethical concerns surrounding the use of neuroimaging technology to manipulate consumer choice through the identification of a "buy button" in the subconscious mind of sports fans would be absolutely unfounded. Sports fans, acting as Econs, would nearly always heir on the side of utility optimization all the while disregarding external marketing stimuli and the many internal emotions underlying personal choice and preference.

12.3 Sports Brand Experiences, Humans, and Irrationality

We clearly do not live in a world of Econs pursuing "absolutes" in the name of steadfast optimization. We live in a world of humans who are highly emotional and irrationally reliant on subconscious heuristics and biases that lead to predictably suboptimal outcomes. Accordingly, neuromarketing utilizes observation, new technology, and statistically driven theoretical frameworks to better explain the various cognitive, emotional, and behavioral anomalies in decision-making. Neuromarketing research explores the many "irrational" mistakes that classical economic theorists have long explained away as supposedly irrelevant factors (SIFs) (Thaler 2015).

The drivers of choice and preference amongst sports fans are decidedly psychological as well as social. The earliest typologies around sports-fan choice adopted a dualistic approach comparing, among other attributes, degree of rationality. "Rational" sports fans could be characterized as impartial, submissive seekers of pleasant entertainment and social networking experiences. "Irrational" sports fans could be characterized as loyal, expressive, seekers of individual identity and emotionally driven tribal connections to team. Dualistic fan typologies gave way to tiered models differentiated by varying intensity of team attachment. "Highly attached" fans attend games regularly, cite a strong sense of team ownership, and link their sense of self to their favorite team, while "moderately attached" fans sought excitement and big entertainment experiences with attendance largely dependent on team success. Fans with "low attachment" identify civic pride and camaraderie benefits synonymous with reading and talking about sports as appealing, but these fans are less inclined to attend live events, regardless of team performance.

Recent models analyzing choice and preference amongst sports fans adopt a multidimensional framework based on differences including: underlying motivations, emotional and economic attachment, identity benefits, degree of loyalty, connective focus, experiential goal and commitment to attending live events. "Impassioned fans" are irrationally loyal to a team, allocate significant financial resources to frequent attendance as a result of an identity-based, obsessive attachment (often maladaptive) to a sports brand delivering escapism benefits. "Invested fans" exhibit rational loyalty by displaying team colors and branded marks while adopting a more moderate and financially proportional approach to attending live events as a result of tempered attachment (usually adaptive) to a sport or league (not necessarily a team) delivering excitement benefits. "Casual fans" allocate scant financial resources towards attendance at live events due to a fragile attachment (often player-based) grounded in social and cultural benefits (Stewart et al. 2003). The migration from dualistic and tiered models towards multidimensional sports fan typologies highlight the many self-defining yet co-dependent values-identity, perceptions-attitudes, motivations-behaviors, and socialization-membership benefits underlying sport consumption.

Passionate, highly engaged sports fans are the bedrock of sports brand experiences as a collective. After all, "the crowd is the supreme authority without which the golden core of the game has no currency" (Taylor 2004). The many-shared

social norms including food (ballpark franks, peanuts, etc.), clothing (team jerseys, colors, etc.), terminology (chants, rhythmic waves, etc.), and symbolism (strangers and friends with whom you gather and cheer) lead behavioral pundits to characterize fan collectives as branded tribes or even brand-based "cults." Cult-like brands are underpinned by relevant and meaningful points-of-difference (PODs) that bind the collective by allowing each individual to feel at ease as a result of being amongst passionate, like-minded brand devotees (Dionisio et al. 2008). Sport is a hypercompetitive personal choice defined by a formal series of public and private rituals within a sacred place while religion is a noncompetitive personal choice defined by public and private social norms within a sacred space (Prebish 1992). This comparison of sport to religion may be uncomfortable for some, but there is no denying the importance of defined social norms and sacred structures to devotees of both sports brands and religions.

In a marketplace made up of emotional and predictably irrational humans, as opposed to mythical Econs, ethical concerns surrounding the use of neuroimaging technology are relevant but premature. There is no evidence that marketers, sports marketers included, have identified a "buy button" in the subconscious mind of consumers. That said, branded experiences that evoke strong psychological (values, emotional, and identity) preference have an opportunity to utilize neuromarketing tools to differentiate their brand in the narcissistic minds of current and prospective consumers. Branded experiences, like sports, that evoke both individual psychological (values, emotional, and identity) allegiance and authentic social (tribes and cults) linking are likely to have unique leverage when utilizing neuromarketing tools to inform efforts to up-sell consumers.

While ethical concerns surrounding the use of neuromarketing tools and tactics in sports are overstated at present, sports leagues and sports teams desire to build "sacred places" that will serve as the centerpiece branded communities. Sports leagues and teams are committed to the (re)construction of existing and new sports venues, often anchoring community revitalization initiatives. By investing in next generation facilities and partner technologies, sports brand experiences will become uniquely engaging, technology-driven, and sensory rich both in-stadium and at-home. Additionally, sports brands will increasingly utilize advanced analytics to dissect "big data" and inform more personalized, targeted marketing efforts. Highly personalized branded fan experiences informed by big data, although largely coveted at present, come at a substantial future ethical price in the hands of sports marketers absent integrity and a moral compass.

12.4 Innovation, Marketing, and Ethical Considerations for Sport

The traditional in-stadium game day experience can be characterized as underwhelming given unpleasant seating (comfort, distance away from play, obstructed views, etc.), inconvenient sportscape design (distance and lines for parking,

concessions, bathroom, etc.), uninspiring small and static signage (menus, advertising, scoreboards, etc.), and unappetizing food/drink choices (hot dogs, hamburgers, popcorn, soda, etc.). Despite this uninspiring sensory environment, a 1998 ESPN Poll found that 54 % of sports fans would rather attend a live game than watch at home. At the onset of the twenty-first century, sports leagues and media partners sought to deliver a more engaging at-home fan experience through innovative camera placement (NFL Skycam, NHL Netcam, MLB Center-Field Camera, etc.) and on-screen technology enhancements (NHL glow puck, NFL first and ten graphics, MLB electronic strike zone, etc.).

This focused effort aimed at rounding out a more compelling at-home fan experience has been successful to the point of being punitive. When the same ESPN poll was re-administered in 2011, only 29 % of fans preferred attending the live event as man-caves and she-sheds ensure access to one's own fridge, clean bathroom and connected wireless devices that allow for viewing of multiple games and monitoring of fantasy league results, at the same time (Northwestern University 2015). As one of the last live, in-the-moment branded experiences, sports executives recognize that tomorrow's stadium must become sensory-rich, technology-enabled, communal data hubs. As such, sports executives are (re)constructing stadiums with wireless networks, mobile apps including point-of-sale systems and payment capabilities, geo-locating beacons, touch screen kiosks, giant HD video screens, high speed cameras, action camera (GoPro) video streaming, RFID chips, and dynamic ad-based signage, among others.

High speed cameras, supported by Giant HD screens, are now capable of snapping photos of each fan in attendance and memorializing priceless emotional reactions as "selfies." Interestingly, upwards of 25 % of attendees are downloading the app to view photos during live events (Reddy 2015). Modern stadiums now boast 40-plus gigabit-per-second Wi-Fi networks that enable a choose-your-own-adventure brand experience through traditional fixed seating areas, premium boxes, and social spaces (standing room only) (Sissons 2016). The personal log-in information required of fans to access stadium Wi-Fi and proprietary game day technology represent "permission-based," data-rich touch points with sports fans. Using geo-location beacons placed strategically through the stadium, sports marketers can triangulate each fans location. By tracking where fans are at all times, sports marketers can offer directions and wait times for parking-concessions-bathrooms, deliver food to fans in their seats or social areas and personalize stadium-only promotions for tickets, merchandise and the like. Additionally, sport marketers are engaging fans, through mobile devices, with rich content including weather updates, in-game trivia and contests, multi-angle camera replay and personalized social media moments captured on stadium displays (Northwestern University 2015).

Sport stadiums are expected to become dynamic entertainment complexes whose economic, environmental, and social impact stretches beyond a finite event schedule. Stadiums, recognized as sacred places amongst fans, are increasingly becoming anchors of urban development and community revitalization. Current event facilities under construction in Milwaukee, Detroit and Los Angeles are designed as the centerpiece of transformational residential, retail, and commercial mixed-use

spaces. These facilities will play host to outdoor concerts and many events beyond traditional basketball, hockey and football games respectively (Sissons 2016). As the centerpiece of dynamic data-driven community spaces, sports venues have a mandate to become more sustainable live, work and play structures. Stadiums must better integrate into their urban surroundings by ensuring unilateral access to connected public spaces like restaurants, bars, and fantasy sports lounges within the venue regardless of event scheduling.

Tomorrow's stadiums, serving as communal data hubs, will collect all brand-based, data-driven fan touch points within customer data platforms (CDPs). These CPD's are scalable and actionable in driving permission-based engagement through personalized, immersive stadium experiences and social linking (Reddy 2015). Data collected in CDPs represent a real and profound ethical concern for sports fans and all residents of communities built with sacred stadiums as the centerpiece. Through permission-based access to personal information/devices, sports brands and marketers therein will have the ability to "track" the purchasing habits, behaviors and attitudes underlying brand loyalty and/or experiential preferences. Informed by neuromarketing research, sports marketers would also capture behavioral responses to personalized "push" marketing stimuli including promotional and partnership activation, contest participation, event preferences, seasonal spending, team and/or player allegiance, fantasy league participation, food fetishes, and the like. The devil is in the data!

Utilizing the aforementioned upgraded stadium technology and insights gleaned through neuromarketing research, sports marketers will increasingly become capable of micro-segmenting markets based on personal motivations, emotional attachment, economic attachment, identity benefits, degree of loyalty, connective focus, experiential goals, and commitment to attend. Using data-driven identities of current and prospective fans, sports marketers could also utilize facial recognition technology to identify "unrecognized" spectators sitting in seats of "known" fans. By collecting a unique data-driven identity of the behavioral and emotional responses to event-related brand experiences, sport marketers would be capable of up-selling food, ticket packages, team-player branded merchandise, social media memories, and incentives to activate partnerships with exclusive vendors.

Acting as the mixed-use data hubs within revitalized residential, retail, and commercial communities, sports venues would likely become aggregators of data-driven consumer touch points reflecting emotional and behavioral responses to branded relationships with ALL communal vendors/partners. The collection, perceived "ownership," and potential sharing/selling of consumer data with communal vendors/partners present genuine ethical concern moving forward. There is little doubt that sports marketers and partner brands, armed with data-driven consumer avatars, would be capable of and tempted to (up)sell branded experiences that sports fans may want, but certainly don't need. Ethical concerns around the identification of a neural "buy button" in the mind of sports fans remain overstated. But, the eventual manipulation of consumer choice may well be achievable by brands that satisfy unique values-identity, perceptions-attitudes, motivations-behaviors, and socialization-membership benefits, like sports.

There is little doubt that Apple, Coca Cola, IBM, Toyota, GE, McDonald's, BMW, Disney, Nike, and Southwest Airlines aim to create branded experiences that deliver emotional, values, and often identity-based benefits to current and future consumers. To the best of my knowledge, none of these revered global brands intends to erect sacred branded places meant to serve as the anchor of revitalized retail, residential, and commercial communities. The sporting firm clearly has a unique mandate to collect, analyze, interpret, and share consumer data with integrity.

> We are not thinking machines that feel. We are feeling machines that think! (Antonio Damasio)

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ERRATUM TO

Chapter 4
A Guideline for Ethical Aspects in Conducting Neuromarketing Studies

David Hensel, Lisa-Charlotte Wolter, and Judith Znanewitz

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David Hensel, Lisa-Charlotte Wolter, and Judith Znanewitz

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D. Hensel • J. Znanewitz
Helmut Schmidt University, Hamburg, Germany
e-mail: hensel@hsu-hh.de; znanewitz@hsu-hh.de

L.-C. Wolter (✉)
Hamburg Media School, Hamburg, Germany
e-mail: l.wolter@hamburgmediaschool.com

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Addenda

A.1 The NMSBA Code of Ethics for the Application of Neuroscience in Business

Adoption of this code is a condition of membership to the NMSBA. The code may be revised from time to time to ensure that it adequately reflects the highest ethical standards for the neuromarketing research industry.

The NMSBA code accepts the principles enshrined in the ICC/ESOMAR code.

A.1.1 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 organisation carrying out, or acting as a neuromarketing consultant on, a neuromarketing research project, including those working in organisations buying services from a neuromarketing research company.
3. Neuromarketing client is defined as any individual or organisation that inquires, buys or sponsors or a neuromarketing research project.
4. Neuromarketing research participant is defined as any individual or an organisation 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.).

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7. Functional brain imaging is defined as any technique that permits the in vivo visualisation of the distribution of brain activity.

A.1.2 Article 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.

A.1.3 Article 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.

A.1.4 Article 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.

A.1.5 Article 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.

A.1.6 Article 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.

A.1.7 Article 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.

A.1.8 Article 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.

A.1.9 Article 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.

A.1.10 Article 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 organisation (including the use of any outside consultants).

A.1.11 Article 10: Publication

When results of a project are publicly shared, neuromarketing researchers shall clearly articulate which part of the report represents 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

A.1.12 Article 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.

A.1.13 Article 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

A.2 The European Code of Conduct for Research Integrity (Extract)

[…]

A.2.1 The Code of Conduct

A.2.1.1 Preamble

This Code of Conduct is not a body of law, but rather a canon for self-regulation. It is a basic responsibility of the scientific community to formulate the principles and virtues of scientific and scholarly research, to define its criteria for proper research behaviour, and to set its own house in order in case scientific integrity is threatened.

Science as the process of knowledge augmentation is embedded in a wider socio-ethical context, and scientists must be aware of their specific responsibility towards society and the welfare of mankind. They bear responsibility for the choice of subjects to be investigated and its consequences, for proper care and treatment concerning the objects of research, and attention and concern with respect to practical applications and use of their research results. In this Code, however, we confine ourselves to standards of integrity while *conducting* research, and do not consider this wider socio-ethical responsibility.

A.2.1.2 Code of Conduct

Science, including natural and social sciences as well as humanities, is the systematised knowledge obtained through observation and experimentation, study and thinking. Scientific research is carried out to determine the nature and principles of what is being studied. In spite of their differences in content and methods all sciences have a common characteristic: they depend on arguments and evidence, i.e. observations of nature or of humans and their actions and products.

Researchers, research institutes, universities, academies and funding organisations commit themselves to observe and to promote the *principles* of scientific integrity. These include: honesty in reporting and communicating, reliability in performing research, objectivity, impartiality and independence, openness and accessibility, duty of care, fairness in providing references and giving credits, and responsibility for future science generations.

Research institutes, funding organisations, academies and other actors in the field of scientific research have to adhere to appropriate standards for data management and preservation of records and data and to high ethical standards in dealing with research participants.

Research employers (universities, institutes and other research performing organisations) also have a responsibility to ensure that a *culture of research integrity* prevails. This includes clear policies and procedures, training and mentoring of researchers at all stages of their careers, and robust management procedures to ensure that high standards are observed and any transgression is identified at an early stage.

Fabrication and falsification, including misrepresentation and deliberately omitting unwelcome facts or data, are among the most serious *violations* of the ethos of science. Also plagiarism is an unacceptable form of misbehaviour, and a violation against other researchers.

Institutes or organisations that fail *to deal* properly with such wrongdoing are also guilty of dereliction of duty. All allegations should be properly assessed, and credible allegations should be investigated fully, with corrective actions taken if allegations are confirmed.

Minor misdemeanours, reflecting only poor performance by researchers as opposed to serious misconduct—some adjustment or selecting of data or 'adaptation' of a figure—may not give cause to a formal charge. Minor misdemeanours by students or junior researchers should however always be reprimanded and corrected by teachers or mentors. Minor misdemeanours by more experienced researchers that leads to misrepresentation may be treated more seriously, and if repeated should be considered as misconduct.

In addition to the violation of the fundamental principles of responsible science many other forms of poor and inappropriate *practices* in science research deserve attention. These include poor data practices and inadequate data management, inappropriate research procedures, including questionable procedures for obtaining informed consent, insufficient respect and care for participants in the research, improper research design and carelessness in observation and analysis, unsuitable authorship or publishing practices, and reviewing and editorial derelictions. Some of these are very serious and discreditable, e.g. abuse of ethical requirements and of trust in relation to the public, research subjects or other participants in the research. However, unlike the fundamental principles of scientific integrity and the violation thereof, which have a *universal* character, such practices may be subject to different national traditions, legislative regulations or institutional provisions. A required system of regulations of good practice in research should, therefore (except for gross violations of ethical principles or the law), not be part of a universal *Code of Conduct*, but should be developed in the form of national *Good Practice Rules*, that would recognise the legitimate differences between national or institutional systems.

[…]

A.2.2 Background and Elucidation

In this section a more extensive elucidation of the condensed Code of Conduct, presented in Chap. 2, is given. The nature of science and scholarship, the values to be fostered in scientific and scholarly research, the various discreditable forms of

misconduct will be discussed, and procedures for dealing with allegations of misconduct and rules for good research practice will be recommended.

[…]

A.2.2.1 Integrity in Science and Scholarship: Principles

Both the definition of scientific misconduct and the specification for proper scientific practice are based upon principles of scientific integrity. These are principles that all scientific and scholarly researchers and practitioners should observe individually, among each other and toward the outside world. These principles include the following:

- *Honesty* in presenting research goals and intentions, in precise and nuanced reporting on research methods and procedures, and in conveying valid interpretations and justifiable claims with respect to possible applications of research results.
- *Reliability* in performing research (meticulous, careful and attentive to detail), and in communication of the results (fair and full and unbiased reporting).
- *Objectivity*: interpretations and conclusions must be founded on facts and data capable of proof and secondary review; there should be transparency in and verifiability of the scientific reasoning.
- *Impartiality* and *independence* from commissioning or interested parties, from ideological or political pressure groups, and from economic or financial interests.
- *Open communication*, in discussing the work with other scientists, in contributing to public knowledge through publication of the findings, in honest communication to the general public. This openness presupposes a proper storage and availability of data, and accessibility for interested colleagues.
- *Duty of care* for participants in and the subjects of research, be they human beings, animals, the environment or cultural objects. Research on human subjects and animals should always rest on the principles of respect and duty of care.
- *Fairness*, in providing proper references and giving due credits to the work of others, in treating colleagues with integrity and honesty.
- *Responsibility for future science generations*. The education of young scientists and scholars requires binding standards for mentorship and supervision.

A.2.2.1 Integrity in Science and Scholarship: Misconduct

Violating these basic norms leads to research misconduct, which is the crux of inappropriate behaviour in science. Research misconduct is damaging to *science*, because it may create false leads for other scientists or the results may not be replicable, resulting in a continuation of the deception. It is also harmful to *individuals* and *society*: fraudulent research may result in the release and use of unsafe drugs, in

the production of deficient products, inadequate instruments or erroneous procedures.

Furthermore, if policy or legislation is based on the results of fraudulent research, harmful consequences are not inconceivable. But damage is also done through the subversion of the public's *trust in science*. The credibility of science would decline and trust in science as a dependable source of information and advice in respect of numerous decisions, so important for the welfare of mankind and society (environment, health, security, energy), would be subverted. This could lead to undesirable restrictions on permissible research, which could further damage the pursuit of knowledge.

There is some empirical evidence4 that there is an increasing incidence of research misconduct. Pressure to publish, commercialisation, greater competition for funds, more opportunities for instance through the internet, evaluation practices, and the current career system for scientists, may all contribute to this unfortunate development.

The two most serious violations of the ethos of science are fabrication and falsification. *Fabrication* is making up results and recording or reporting them. *Falsification* is manipulating research processes or changing or omitting data. Fabrication and falsification can also arise in the reporting of other researcher's results, in the reporting of expert opinion and in the public dissemination of science. A third category of misdemeanour is plagiarism in proposing, performing, or reviewing research, or in reporting research results. *Plagiarism* is the appropriation of another person's ideas, research results or words without giving appropriate credit. The precise wording of an idea or explanation or illustrative material (such as original figures and photographs, as well as lengthy tables) in textbooks or popular material are protected by copyright laws, but nevertheless can be subject to plagiarism. Plagiarism is of a different order since it is supposed to be more injurious to fellow scientists than to science as such. However, we have seen that openness is one of the basic integrity principles, and that progress in science depends on communication and discussion among fellow scientists and on a well-functioning peer-review system. And if scientists would hesitate or even refuse to practise this openness and communication for fear of not being recognised as devisor or author the quality of science would suffer as well.

Also *improper dealing* with such infringement of principles of integrity (attempts to cover up, reprisals to whistle-blowers and violations of due process) can be classified as misconduct. In general it should be underlined that research institutes, funders, academies, universities and other actors conducting and administering research have the duty to promote good research management so that research integrity is instilled into the culture.

It is generally accepted that the primary responsibility for handling cases of misconduct is in the hands of the employers of scientists doing research. Frequently this concerns the institute or university where the accused researcher works. These institutions should have a standing committee that deals with misconduct, or establish an *ad hoc* committee in case a serious allegation is brought forward.

Furthermore, there is a general consensus on the need for a due and fair process, that is uniform and sufficiently rapid, and leads to proper outcomes and sanctions. A coordinating committee for facilitating international research misconduct investigations of the OECD has formulated a number of overarching principles for investigating research misconduct in international collaborative projects, which can be adopted for general application. Annex I contains recommended principles that follow the main lines of the OECD recommendations.

Responses will depend on the seriousness of the research misconduct. In this respect the level of intent of the misconduct, the consequences of the behaviour, and other aggravating and mitigating factors should be considered. It has to be shown that the misconduct was committed intentionally, knowingly or recklessly. As standard proof for the culpability of a suspected researcher 'preponderance of evidence' should be applied. It should be stipulated that research misconduct does not include honest errors or differences in opinion.

It should be recognised that the demarcation line between unacceptable and still acceptable behaviour is not always clear and beyond academic debate. Where does one draw the line between verification on a too small sample and the illustration of an argument with 'case' data? Where is the boundary between plagiarism and careless citation? Was an incorrect, but 'favourable' statistical technique truly chosen deliberately? Was a biased selection of data meant to start a scientific discussion or intended to present a full review of the evidence?

In the literature another class of misconduct is discussed, the 'questionable research practices' (QRP). Three groups of misbehaviour fall within QRP: Firstly, personal misconduct: intimidation of students, harassment, discrimination, insensitivity to social or cultural norms in doing research, misuse of funds, etc. Although we deal with undesirable and, at times, unacceptable conduct here it is not 'scientific misconduct', since it does not affect the integrity of the research record. Much of this misbehaviour is subject to generally applicable legal and social penalties that apply to everyone.

Secondly, a varied group of bad research practices, such as bad data management, incorrect research procedures, or some publication related misconduct. Bad practices are not acceptable and often harmful to the public's trust in science. They need correction indeed, but are not necessarily basic infringements of scientific integrity. The next section will deal with this category.

In the third place, minor misdemeanours that may not lead to formal allegations and investigations, but are just as damaging given their probable frequency: some 'adjustment' of data, cutting a corner, omitting an unwelcome observation… It should be clear that here we deal with unacceptable violations of the principles of scientific integrity: it is falsification *in statu nascendi*. If it occurs with students or junior scientists, it should be corrected through proper supervision and mentorship. With more experienced researchers, especially if seen to be repeated, it should be treated more seriously.

It should be emphasised that the principles discussed in the previous section and the infringements defined in this section refer to *fundamental* and *universal* norms for responsible conduct in research. There is no need for cultural or regional

adaptations or compromises in a Code of Conduct that encompasses these principles and infringements.

A.2.2.3 Good Practices

In addition to fabrication, falsification and plagiarism many other forms of objectionable practices in scientific research deserve attention. Some of them have serious moral or legal consequences, others may create nuisance, discontent or procedural dissension. Many of them may undermine public trust in science same as basic infringements of scientific integrity, and should therefore be taken seriously by the scientific community. The following categories may be distinguished:

1. *Data practices*, including data management and storage, placing data at the disposal of colleagues who want to replicate the findings, adequate preservation of original data.
2. *Research procedures*. Deviations from desired practices include insufficient care for research subjects, insufficient respect to human subjects, animals, the environment, or cultural heritage; violation of protocols; failure to obtain informed consent; insufficient privacy protection; improper use of laboratory animals; or breach of trust (e.g. confidentiality). Improper research design, carelessness in experimentation and calculations that lead to gross errors, may also be classified under this heading, although the partition-wall between incompetence and dishonesty may be rather thin here.
3. *Publication-related* conduct, including authorship practices. It is unacceptable to claim or grant undeserved authorship and to deny deserved authorship, or to inadequately allocate credit. Breaching of publishing rules, such as repeated publication, salami-slicing of publication, no or a too long delay in publication, or insufficient acknowledgement of contributors or sponsors, fall within this category as well.
4. *Reviewing* and *editorial* issues, including independence and conflict of interests, personal bias and rivalry, appropriation of ideas.

Again, the dividing line between acceptable and not acceptable practices is somewhat vague, and may vary over nations, regions or disciplines. But there is also a thin borderline between some violations of these practices and the serious types of misconduct, as discussed in Sect. A.2.2.2. Unjustified claimed authorship and ghost authorship are forms of falsification, purloining ideas as an editor or reviewer is plagiarism, causing pain or stress to research participants or to expose them to hazards without informed consent is certainly ethically unacceptable behaviour. But in general these ‘good practices’ refer to practical rules and arrangements in conducting, administering and reporting research.

Unlike the fundamental principles of scientific integrity and the violating of these principles through fabrication, falsification or plagiarism, which have a universal character, good practices as outlined above may be subject to cultural differences: definitions, traditions, legislative regulations and institutional provisions

may vary over nations or regions, sometimes also over disciplines. A required system of regulations of good practices in research should, therefore, not be part of a universal Code of Conduct. It should rather be developed in the form of national or institutional *Good Practice Rules*, recognising the legitimate differences between national, disciplinary or institutional systems. Nevertheless a list of issues to be addressed in such Rules (see Sect. A.2.3 below) should be provided, including recommendations on how to deal with them. In general such recommendations are based on general assent, but, as said, rules of procedure must allow for national differences and cannot claim catholicity.

A.2.3 Guidelines for Good Practice: Rules

In these guidelines the following categories of good practices in scientific and scholarly research are distinguished: proper data practices, proper (technical as well as responsible) research procedures, well-considered publication-related conduct and responsible reviewing and editorial procedures.

Each country should adopt, amend or supplement these recommendations in accordance with its legislative requirements or traditions and compose an own set of Good Practice Rules. Then the scientific society will require all its members to adhere to these Rules, and will also ask its institutes and scientific organisations to require their own members to comply.

1. Good data practices: availability and access
   - All primary and secondary data should be stored in a secure and accessible form.
   - Original scientific or scholarly research data should be documented and archived for a substantial period (at least 5 years, and preferably 10 years).
   - Research data should be placed at the disposal of colleagues who want to replicate the study or elaborate on its findings.
   - Freedom of movement of scientists, the right to peaceably and voluntarily associate with other scientists, and the freedom of expression and communication should be guaranteed.
2. Proper research procedures
   - All research should be designed and carried out in a careful and well-considered manner; negligence, haste, carelessness, and inattention should be avoided, so as to prevent human errors.
   - Researchers should try to deliver what has been promised in the application for support or funding.
   - Researchers must seek to minify any harmful impact on the environment, and should be aware of the need for sustainable management of resources; this implies an efficient deployment of the (financial and other) resources, and minimisation of waste.

- Clients and/or sponsors should be alerted to the ethical and legal obligations of the researcher, and to the possible restrictions this may imply.
- Clients and/or sponsors should be made aware of the vital importance of publication of the research findings.
- Confidentiality of data or findings should be respected by the researcher when it is legitimately required by the client or employer.
- Proper account will be given to the sponsor in case a grant or co-funding was received for the research.

3. Responsible research procedures

- All research subjects, be they human, animal, cultural, biological, environmental or physical, should be handled with respect and care.
- The health, safety or welfare of the community, or of collaborators and others connected with the research, should not be compromised.
- Sensitivity to age, gender, culture, religion, ethnic origin and social class of research subjects should be evinced.
- Human subject protocols should not be violated: this implies complying with the requirement of informed consent on the basis of adequate and appropriate information, and to voluntary agreement to participate, treating personal information with highest possible confidentiality, avoiding unnecessary deception, and using the obtained information only for the purpose of the investigation.
- The use of animals in research is acceptable only if alternative ways to achieve the results have been investigated and have been found inadequate; any harm or distress to be inflicted on an animal must be outweighed by the realistic expected benefits and must be minimised as much as possible.

4. Publication-related conduct

- Researchers should publish the results and interpretations of their research in an open, honest, transparent and accurate manner.
- Researchers should strive to ensure the earliest possible publication of the results of their research, unless commercial or intellectual property considerations (e.g. patent application) justify delay.
- Authorship should only be based on a creative and significant contribution to the research (i.e. contribution to the design, data collection, data analysis, or reporting, not for general supervision of a research group or editing of text). Guest authorship (i.e. listing authors who do not qualify) or ghost authorship (i.e. omitting individuals who meet authorship criteria) are not acceptable. All authors are fully responsible for the content of the publication, unless it is specified they are responsible only for a specific part of the study and publication.
- Sequence of authors should be agreed by all authors, ideally at the start of the project or the initiation of the article/monograph, and may follow national and/or disciplinary codes. The criteria for deciding the order of authors should be agreed at the start of the project or writing.

- The work and contribution of collaborators and assistants should be acknowledged if appropriate, with their permission.
- All authors should declare any relevant conflict of interest, which may be financial, commercial, personal, academic, or political.
- Important work and intellectual contributions of others that have influenced the reported research should be appropriately acknowledged. Related work should be correctly cited. References should be restricted to (paper or electronically) printed publications and publications 'in print'.
- In communication with the general public and in popular media the same standards of honesty and accuracy should be maintained; any attempt to exaggerate the importance and practical applicability of the findings should be resisted.
- Publication of the same (or substantial parts of the same) work in different journals is acceptable only with the consent of the editors of the journals and where proper reference is made to the first publication. In the author's CV such related articles must be mentioned as one item.
- Financial or other types of support for the research and its publication should be properly mentioned and acknowledged.

5. Reviewing and editorial issues

- An editor or reviewer who has a relevant potential conflict of interest—which may be personal, academic, political, commercial or financial—should, ideally, withdraw from involvement in any publication decision. If the conflict is considered minor or unavoidable it should be disclosed to the readership.
- Reviewers should provide thorough, accurate, objective, and justifiable assessments in a timely manner.
- In the review of a manuscript, confidentiality must be maintained.
- Reviewers and editors shall not make any use of the data or interpretations presented in submitted manuscripts without the author's permission.
- The same standards and rules apply in the review process with regard to projects or programmes submitted for funding, rewards or reconnaissance purposes.
- The same standards and rules apply in the review process of individuals or institutions for appointments, promotion, awards or other forms of recognition.

[…]