Chapter 4
A Guideline for Ethical Aspects in Conducting Neuromarketing Studies

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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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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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