Public Understanding of Neural Prosthetics in Germany: Ethical, Social, and Cultural Challenges

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Since the development of the first neural prosthesis, that is, the cochlear implant in 1957, neural prosthetics have been one of the highly promising, yet most challenging areas of medicine, while having become a clinically accepted form of invasiveness into the human body.[1] Neural prosthetic devices, of which at least one part is inserted into the body, interact directly with the nervous system to restore or replace lost or damaged sensory, motor, or cognitive functions.[2] This field is not homogenous and encompasses a variety of technologies, which are in various stages of development. Some devices are well established in clinical practice and have become routine, such as cochlear implants. By comparison, other technologies are in experimental phases and still need to be further developed to achieve the desired results.

As a result of recent advances in implantable neural prosthetics and their possible clinical uses, for example, deep brain stimulation (DBS) for the treatment of psychiatric disorders, the scientific and medical communities as well as the public have shown an increasing interest in these new technologies. Print media have generally popularized these topics to the point of more than just idle curiosity. These novel technologies have not only brought many therapeutic hopes, but also raised considerable ethical and social concerns in society. Although these same considerations are continually being discussed within the scientific community, it is unknown whether the public shares the same perception regarding these controversial issues.

The aim of this exploratory study was to conduct a detailed examination of current discussions on neural prosthetics in German print media coverage while focusing on the public perception of ethical and social challenges. For this purpose, 10 years of German print media (1999–2009) were analyzed. Both quantitative (descriptive statistics) and qualitative methods (textual analysis) were employed. Issues regarding the gathering and dissemination of information are covered in the following topical questions: How is the public informed about neural prosthetics via the print media? What are the dominant images of neural prosthetics being communicated in the media? How has the topic of neural prosthetics been featured in the print media? Which representation strategies are being used in the reports? What topics in relation to neural prosthetics are most often being discussed? How is the reporting of information organized and structured? What role do ethical and social issues play in the media?

Methods

For this investigation, 12 newspapers and magazines of different categories, which represent the German media landscape, were selected. The selections were

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based on the following criteria: they should represent a broad spectrum of circulation on a national level, have noticeable influence on public opinion, and appeal to different target groups. The following newspapers and magazines were studied: *Die Welt*, *Die Tageszeitung*, *Frankfurter Rundschau*, *Süddeutsche Zeitung*, *Der Spiegel*, *Focus*, *Stern*, *Die Zeit*, *Wirtschaftswoche*, *Bild der Wissenschaft*, *Gehirn & Geist*, and *Bild*.

We searched for articles by using the following keywords: deep brain stimulation, cochlea implant, retina implant, brain–computer interface, neural prosthetics, brain implant, neuro-chip, neural stimulation, brain–machine interface, neural implant, and neural prostheses. Both German and English terms were used. The investigation period covered January 1, 1999, to December 1, 2009. All articles were analyzed by two coders according to the coding system, which was adapted from existing research in American, British, and Canadian print media.[3] The following categorical variables were studied: tone of articles, art of explanation, art of problems, and the prospects.

Quantitative Analyses

Our search resulted in 286 articles in German print media between 1999 and 2009 (10-year period). The articles were distributed over the years 1999 to 2009 as shown in Figure 1. One clearly notes the rise in media interest in the second half of the examined period. The majority of articles (n = 159, 55.6%) involved a simplified explanation of neural prosthetics. The use of technology was often described with the help of one or two sentences. In 50 (17.5%) articles, the functioning of neural prosthetics was explained in detail. In 77 articles (26.9%), no explanation of these technologies was provided.

The majority of articles (n = 146, 51%) were uncritical. The articles focused on only the positive aspects and benefits of the neural prosthetics. The second largest group of articles (n = 77, 26.9%) was neutral; these articles had only a report character: neither the risks nor benefits were shown. In total, 54 articles (18.9%) had a balanced character; in other words, these articles showed both the positive aspects of these technologies and the risks involved. Notably small was the number of articles that viewed the subject critically. Only 9 articles (3.1%) had a negative connotation.

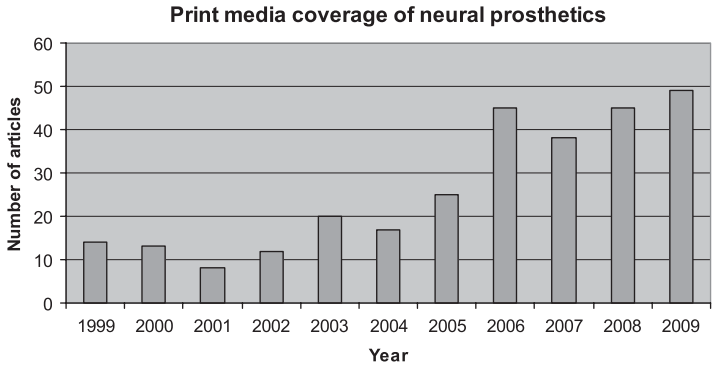

Figure 1. Number of articles per year (1999–2009).

Predominantly, scientific and medical problems were addressed in connection with neural prosthetics (n = 123, 43%). The potential risks of these technologies were discussed from a scientific or medical point of view in these articles. The second largest segment of the sample did not broach any problematic issues regarding neural prosthetics. In 5 articles, economic problems were addressed. In only 20 articles (7%) were ethical problems and social concerns mentioned or discussed.

The majority of the articles (n = 252) dealt with neural prosthetics in connection to their application for improving health and treating diseases. In 34 articles, benefits and possible applications of neural prosthetics were discussed with no relation to health; for example, the articles addressed matters of human enhancement or military use.

Qualitative Analyses

As the quantitative study has shown, the overwhelming majority of articles were positive and discussed the advantages and prospects of these new technologies. The main focus of the message in these articles is on the possible improvement of the quality of life of patients with the help of neural prosthetics: "They neither make a person the superman nor make someone a soulless semi-automaton—they make life easier for him. They can also, in the case of those with severe disabilities, make life more humane."[4] Sometimes, the expressed hopes for the future even merge into science fiction scenarios, where a human being melds with advanced technology. Such futuristic ideas involve mostly non-health-related applications, such as human enhancement.

Remarkably, only a small number of articles are critical or balanced. The main points of the critical arguments reflect the medical or scientific point of view. One often cited critical medical argument is that neural prosthetics is a new domain in medicine and the long-term effects and consequences have not yet been well investigated. This is especially the case with implants related to the brain and their possible impact on personality and other side effects.

A further criticism is that neural prosthetics do not cure patients completely. They restore lost or damaged functions only to some extent. For instance, retinal implants currently allow patients to distinguish shadows but do not restore a person's sight completely. As such, further research is necessary.

Ethical Issues

Only a small number of the articles address the ethical problems associated with neural prosthetics. The use of DBS for treating psychiatric diseases is most often discussed. In relation, the following aspects are often mentioned: the invasion of a person's identity, possible change in personality, and possible misuse of this technology to manipulate the patient and control his behavior. Some articles parallel the historical experiences with neurosurgery (operative cerebral procedures on mentally ill patients) of the past, for example, performing a lobotomy.

Additional ethical issues mentioned with neural prosthetics include informed consent, that is, using these technologies on people who cannot decide for themselves, for example, those in a coma or mentally ill. Some articles discuss the possible impact of neural prosthetics on the concept of the human body and the human being.

Representation Strategies of Reporting

It is notable that many articles have a sensational character in reporting the promising results of neural prosthetics. Often the article headlines are sensational, hopeful, and refer to successful results associated with these technologies. The following examples of headlines support this statement: ''Brain pacemaker returns coma patients to speaking''; ''Thanks to brain pacemaker coma patient speaks again''; ''This is more than just a six in the lotto''; ''Deep brain stimulation cures tic illness''; ''Electrodes expel headache''; ''Researchers allow blind people to see again''; ''Roborat: brain implants allow remote control of rats''; ''Deep brain stimulation stops severe depression''; ''Paralyzed will walk again''; ''Retina implant brings blind people back into the light''; ''Chip cures blind people''; and ''Bionic eye lets blind people see again.''

Additionally, a representation strategy employed in the reporting of personal stories and individual tragic histories is the use of the first-person narrative. Typically, the article describes an individual who had suffered a severe illness or was seriously disabled, and then successfully underwent neurosurgery. The reporting of the story is emotionalized. A neural prosthetic is often shown as a last hope for the patient. At the beginning, the article describes the dramatic life situation of the person with the disease: ''A good three years ago Thomas Merz had only one thought: he did not want to live any more. The 44-year-old degreed engineer . . . was tormented by obsessions and depressions.''[5]

The second part of the article addresses the implantation of neural prosthetics and sensational healing: '''Finally, I enjoy my life again,' according to Pöllen. 'Since the operation I feel reborn. Now I celebrate my birthday two times a year!'''[6] Such articles have a miracle story character and may inspire readers, especially those who suffer from a similar disease, as they relate to the other's plight by identifying with the person described and hope that they, too, may experience similar results from the treatments.

Another noticeable feature of media representation is that it often details successful clinical studies, thus legitimizing the context. Opinions of leading specialists of such technologies, such as Prof. Dr. Volker Sturm from the Clinic of Cologne, who successfully works with DBS in Germany, are often cited. By quoting experts, the media can exert a powerful influence with regard to shaping the acceptance of these technologies by the public.

Conclusion

The results of the analysis of German print media coverage show that there is growing interest in neural prosthetics. The interest in this topic probably lies in the historic–cultural tradition, where neural implants take a special position in the human-technology debate as they come extremely close to a human body, ''reaching the 'holiest' part of a human being, his brain.''[7]

The second reason for the strong media interest can be explained by the fact that neural prosthetics technology, especially brain–computer interface, mirrors the concepts in science fiction literature and film, where the topic of the merging of human and technology has long since been a theme and now seems to be becoming a reality.

It is obvious that an optimistic representation of these technologies dominates the reporting. The reporting of neural prosthetics often spills over into enthusiasm about the possible application of these technologies for both health-related and non-health-related purposes, which are often referred to as technologies of the future. The reader finds out about new developments, mostly as a sensation or even as a groundbreaking technological innovation.

Many articles are emotionally charged, sensation oriented, and marked by far-reaching hopes. There is often speculation about the successful future application of neural prosthetics. Reports tell of ''miracle stories'' with ''fantastic progression'' and impressive results, which lead to the complete disappearance of the symptoms.

Discussion about scientific issues dominates ethical content. Often, the problems associated with medical or scientific points of view such as the need for further development of the technical aspects of devices are discussed. Only a few articles (3.1%) are critical and appeal to the ethical aspects of neural prosthetics, which in most cases regard the use of deep brain stimulation for treating psychiatric diseases as unethical.

The results show the discrepancy between scientific discourse, in which ethical questions play a role, and the social discussion in the media in which the ethical issues regarding these technologies hardly garner any notice. Thus, there is a communication problem between the scientific community and the media. We found that the tendency of the media was to emotionally charge the public through sensationalism rather than report about the social and ethical issues. As a result, issues regarding medical ethics concerns seldom receive the attention of the media and thus the public.

The mass media are an important source of health information as well as an influential factor of the ethical climate in the medical field. The practice of journalism, while mediating between experts and laypersons, and disseminating knowledge, requires a certain level of responsibility in informing the public. Consequently, it is essential to encourage a constructive dialogue between scientists, ethicists, and journalists in order to avoid the dissemination of inaccurate, inadequate, or sensationalized information regarding neural prosthetics.

Notes

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