"Currents of Hope": Neurostimulation Techniques in U.S. and U.K. Print Media

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The application of neurostimulation techniques such as deep brain stimulation (DBS)—often called a brain pacemaker for neurological conditions like Parkinson's disease (PD)—has generated "currents of hope." Building on this hope, there is significant interest in applying neurostimulation to psychiatric disorders such as major depression and obsessive-compulsive disorder (OCD).[1] These emerging neurosurgical practices raise a number of important ethical and social questions in matters of resource allocation, informed consent for vulnerable populations, and commercialization of research.

The media are, in many respects, at the crossroads of numerous social forces that inform public discourse on science and medical practices. Hence, an examination of the media offers a window into some of the forces that shape public understanding of science and research. This paper reports results of a comparative study of neurostimulation techniques in print media from the United States and the United Kingdom, with a focus on the public understanding of neurostimulation and the coverage of ethical, legal, and social issues.

Methods

We generated a sample of print media using the guided news search function of the LexisNexis Academic database with keyword searches on general sources and newspapers. We ran searches for articles published between 1995 and 2004 in major English-language U.S. and U.K. news sources.[2]

The results on neurostimulation presented here are part of a larger study examining print media coverage of neurotechnology. All articles were systematically coded by two independent coders (S.W. and E.R.) based on the instructions contained in a coding guide. This guide was developed for this specific study based on our research objectives and previous print media studies.[3] The coding structure included an analysis of the type of research presented and related benefits and issues, as well as reporting practices. A blind reliability test on a subsample of 100 articles yielded 0.94 average intercoder reliability. Headlines were subsequently analyzed based on intercoder consensus (E.R., N.P., and D.R.). We use descriptive statistics to characterize the composition

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and properties of the sample and qualitative samples to illustrate salient aspects of the content.

Results

We identified 235 relevant articles[4] in major U.S. (N = 170, 72%) and U.K. (N = 65, 28%) print media sources across the decade under study (Figure 1). Articles dealt both with invasive neurostimulation techniques such as DBS (N = 186, 79%) and noninvasive transcranial magnetic stimulation (TMS; N = 46, 20%). The headlines used to introduce the articles focused on two major identifiable themes: (1) hope for medical treatments, in particular for PD, tremors, and depression and (2) scientific breakthroughs, sometimes with a futuristic twist (see Table 1). DBS headlines included salient reference to PD, TMS headlines to depression and cognitive enhancement, and brain–machine interface headlines to futuristic mind–machine applications.

Following the International Classification of Diseases of the World Health Organization (ICD-10, http://www.who.int/classifications/icd/en/), we found that neurological conditions were featured in 66% (N = 155) of articles with a particular focus on Parkinson's disease (N = 118, 50%), cerebral palsy and other paralytic syndromes (N = 37, 16%), epilepsy (N = 20, 9%), and stroke (N = 19, 8%). Psychiatric conditions were featured in 21% (N = 50) of articles with a focus on mood disorders (N = 42, 18%) and stress-related disorders (N = 14, 6%).

The tone of the articles was mostly optimistic (N = 120, 51%), that is, featuring benefits of research on neurostimulation and its applications. The tone for 31% of articles (N = 72) was balanced (featuring both benefits and risks or issues). The remaining articles were either neutral (N = 33, 14%; no benefits and no risks or issues) or critical (N = 10, 4%; emphasizing risks and issues). Table 2 provides comprehensive data for the presence of benefits and issues. The most frequent clinical benefit was improvement of therapeutic procedures; the key nonclinical benefit was the basic development of devices. Safety and side effects were the most frequently cited scientific and medical issues whereas informed consent and respect for autonomy were the most frequently cited

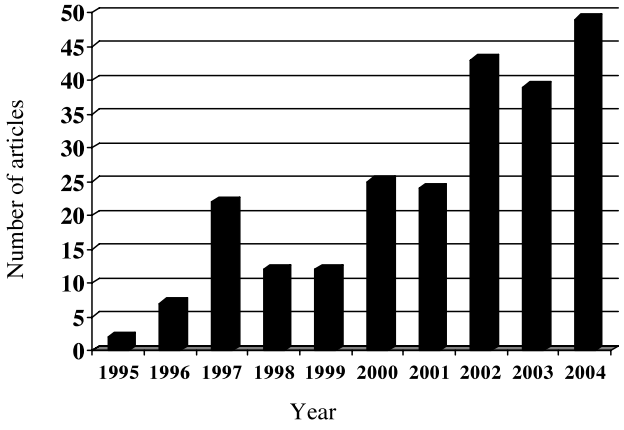

Figure 1. Print media coverage of neurostimulation techniques (1995–2004).

Table 1. Sample Headlines for Print Media Coverage of Neurostimulation Articles

New treatment headlines (41%)
"The potential of brain pacemakers. Implanted devices may alter treatment of many disorders" (*The Washington Post* 6 Mar 2006)
"Currents of hope—A revolutionary device. An electrical pacemaker implanted in the brain gives welcome relief to people afflicted by the shakiness of Parkinson's disease" (*Buffalo News* 11 May 2002)
"Magnetic appeal. New therapy that fights depression sparks a current of optimism" (*The Seattle Times* 27 Mar 2001)
Scientific breakthrough headlines (19%)
"With tiny brain implants, just thinking may make it so" (*The New York Times* 13 Apr 2004)
"Are cyborg troops our future army?" (*The Times* 16 Nov 2003)
"Brain signals shown to move a robot's arm" (*The New York Times* 16 Nov 2000)

ethical, legal, and social concerns. We note that in this sample we did not find any statements discussing the reliability of neurostimulation techniques, discrimination and stigma, or policy and public involvement.

A considerable proportion of articles did not present any explanation of the scientific principles underlying neurostimulation techniques ($N = 93$, 40% of articles). Both elaborate explanations (more than three lines; $N = 53$, 23%) and simple explanations (two or three lines; $N = 89$, 38%) were also found. We further analyzed reporting practices for the subset of articles with an exclusive focus on research reporting ($N = 47$, 20%). The investigators ($N = 38$, 81%), their institution ($N = 41$, 87%), and the number of patients or subjects involved ($N = 28$, 60%) were identified in a majority of these articles. The details on funding sources ($N = 12$, 26%), source of the data, that is, where the study was presented or published ($N = 12$, 25%), details on conflicts of interest ($N = 10$, 21%), details on replication of the results ($N = 7$, 15%), and details on control and comparison groups ($N = 5$, 11%) were identified in fewer articles. We found a personal interest twist in 29% ($N = 67$) of articles. This included first person narratives of patients and sometimes of celebrities undergoing neurosurgery with DBS. Some statements resembled "miracle stories" of patients cured of PD, dystonia, and Tourette's Syndrome.

Discussion and Conclusion

Results of this study show that the public discussion on the ethical, legal, and social issues of neurostimulation techniques differs from the extensive coverage of such issues in media reporting of genetics research. Only 14% of the analyzed papers included ethical content whereas this figure is closer to 40% for print media coverage of genetics and genomics research.[5] In spite of the important costs of neurostimulation devices, the ethics content did not include extensive discussion of resource allocation and fair access. We found that

Table 2. Benefits and Issues in Print Media Coverage of Neurostimulation Techniques

Benefits and issues	Description		%
Clinical benefits	At least one clinical benefit–positive impact of research on		79
	Therapy and surgery	Development of treatments	77
	Prevention	Prevention of health problems	2
	Diagnosis	Diagnostic measures and capabilities	1
Nonclinical benefits	At least one nonclinical benefit–positive impact of research on		23
	Research and technology	Technology development	12
	Personality	Cognitive function and personality	6
	Political	Military and national technological leadership	5
	Economy	Healthcare costs and profits	4
Scientific and medical issues	At least one scientific or medical issue–risks and concerns related to		16
	Safety and side effects	Side effects or harmful physical and psychological consequences	15
	Validity	Research design	1
Ethical, legal, and social issues	At least one ethical, legal, or social issue–risks and concerns related to		14
	Consent and autonomy	Recruitment of research subject, informed consent, and respect of patient preferences	5
	Commercialization and conflicts of interest	Patenting, conflicts of interest, and high costs of neurotechnology	3
	Animal rights	Animal rights and welfare	2
	Meaning of research	Broad meaning of research	2
	Justice and resource allocation	Equal access to technology and healthcare as well as resource allocation	2
	Enhancement	The improvement of "normal" brain function	2
	Dignity and integrity	Treating humans as mere means and not as ends in themselves	1
	Privacy and confidentiality	Sharing of confidential information	1

benefits are often featured in headlines suggesting new therapies or cognitive enhancement with broad applications.

There are limitations to this study, including sample composition, which is limited to English-language sources of the United States and the United Kingdom. However, the data highlight some of the challenges of medical science reporting. The miracle stories about DBS covered by the media could alone increase existing pressures for expedited technology development and associated professional conflicts.[6] Both empirical data and testimonies point to the need for increased collaborations between researchers, physicians, bioethicists, and other stakeholders in the translation of research to the public. We believe that such collaborations are vital to ensure a realistic understanding about the possibilities for extending neurostimulation to a broad range of neurological and psychiatric conditions.

Notes

1. Abbott A. Deep in thought. *Nature* 2005;436(7047):18–9.
2. Keywords searches—performed in headlines, lead paragraphs, and terms to maximize search yields—reflected scientific terminology used to describe the techniques (deep-brain stimulation, neurostimulation, neural stimulation, brain–machine interface, brain–computer interface, neural prosthesis, neural prostheses, transcranial magnetic stimulation, neural implant, cortical implant).
3. Mountcastle-Shah E, Tambor E, Bernhardt BA, Geller G, Karaliukas R, Rodgers JE, et al. Assessing mass media reporting of disease-related genetic discoveries. *Science Communication* 2003;24(4):458–78; Racine E, Bar-Ilan O, Illes J. fMRI in the public eye. *Nature Reviews Neuroscience* 2005;6(2):159–64; Racine E, Bar-Ilan O, Illes J. Brain imaging: A decade of coverage in the print media. *Science Communication* 2006;28(1):122–43.
4. Deep-brain stimulation (N = 114, 49%), transcranial magnetic stimulation (N = 46, 20%), brain–machine/–computer interfaces (N = 27, 11%), neurostimulation (N = 18, 8%), cortical implants (N = 16, 7%), cortical prostheses (N = 14, 6%).
5. Smart A. Reporting the dawn of the post-genomic era: Who wants to live forever? *Sociology of Health & Illness* 2003;25(1):24–49; Tambor ES, Bernhardt BA, Rodgers J, Holtzman NA, Geller G. Mapping the human genome: An assessment of media coverage and public reaction. *Genetics in Medicine* 2002;4(1):31–6; Racine E, Gareau I, Doucet H, Laudy D, Jobin G, Schraedley-Desmond P. Hyped biomedical science or uncritical reporting? Press coverage of genomics (1992–2001) in Québec. *Social Science & Medicine* 2006;62(5):1278–90.
6. Ausman JI. I told you it was going to happen. *Surgical Neurology* 2004;61(4):313–4; Ausman J. I told you it was going to happen . . . Part II. *Surgical Neurology* 2006;65(5):520–1; Ausman J. I told you it was going to happen . . . Part III. *Surgical Neurology* 2006;66(2):222–4.