



Title	Japan and China' s View on Ethical, Legal and Social Implications of Neuroscience
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Citation	Exploring Global Collaborative Learning. 2026, p. 79-86
Version Type	VoR
URL	https://doi.org/10.18910/106364
rights	
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Japan and China's View on Ethical, Legal and Social Implications of Neuroscience

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Abstract: Neuroscience is rapidly expanding beyond clinical medicine into fields such as robotics, AI, education, and consumer technologies, raising complex ethical, legal, and social implications (ELSI). This article examines how Japan and China understand and address ELSI around neuroscience by analyzing both science and technology policy and media coverage. First, I review policy documents to clarify how each country positions neuroscience and whether ethics and social issues are explicitly incorporated. Second, I conduct quantitative text analysis of major national newspapers in Japan (1980–2022) and China (2000–2022) using *KH Coder*, applying correspondence analysis and coding analysis. The results show that Japanese newspapers shifted from basic and medical research in the 1990s to education and “brain boom” topics after 2000, and to AI/robotics collaboration after 2010, while sustained attention to ethical issues—especially privacy—emerged from the mid-2000s. In China, coverage of basic, domestic, and overseas research remained relatively stable, but references to robotics, AI, and policy themes increased markedly after the launch of the China Brain Project in 2016, with ethics (e.g. privacy violations, personality rights, health risks, animal ethics) becoming more salient thereafter. The comparison highlights contrasting policy–media dynamics and offers insights for developing context-sensitive ELSI governance for neuroscience.

Introduction

Neuroscience has rapidly expanded beyond hospitals and clinics into many areas of everyday life. Today, brain research is closely connected with robotics, artificial intelligence (AI), education, and even consumer products such as games, wellness apps, and wearable devices. Because the brain is so deeply tied to who we are as people, this expansion does not only raise technical questions (what can technology do?) but also social and moral questions (what should we do with it?). These broader questions are often discussed under the label ELSI, which stands for Ethical, Legal and Social Implications. In simple terms, ELSI refers to the ways in which new science and technology may affect people's rights, daily lives, and social values. In the case of neuroscience and neurotechnology, typical questions include: Can others read my thoughts if brain activity can be measured in detail? Could our thoughts or emotions be influenced or manipulated by brain technologies? Should there be limits on using neuroscience to enhance memory, attention, or other abilities? Who is responsible if a brain–computer interface affects a person's decisions or behavior?

These are not just abstract philosophical questions. They have very practical consequences for law, medicine, education, and everyday life. For example, if brain data are used in schools or workplaces, rules are needed to decide who can access this data, how it can be stored, and how to prevent discrimination. If companies sell devices that claim to improve children's brains, there must be ways to check their safety and to avoid misleading advertisements.

Because of this, policymakers around the world face growing pressure to create “governance frameworks” for neuroscience and neurotechnology. Governance

frameworks are the laws, guidelines, and institutions that help society decide how to use new technologies in a fair and responsible way. They include, for example, research ethics guidelines, data protection rules, and standards for medical devices. However, making good rules is not easy. It is not enough to copy regulations from other countries or to rely only on expert opinion. As Inui (1982) points out, policy always reflects each country's own history, culture, and national priorities. In addition, the way people think about neuroscience is strongly shaped by the media, such as newspapers and television. As Nisbet et al. (2003) argue, media do more than simply "deliver information." They select which stories to cover, decide how to frame them (for example, as a "breakthrough," a "risk," or a "controversy"), and choose which voices to highlight. In this sense, media plays a central role in shaping public opinion about science and technology.

This article aims to provide practical insights for developing ethical guidelines for neuroscience by focusing on how two important countries, Japan and China, deal with ELSI issues. Rather than treating neuroscience as a purely scientific topic, I view it as part of a broader social process in which policy, media, and public debate interact with each other.

Japan and China are chosen as comparative cases for several reasons. Both are major actors in neuroscience and related technologies such as AI and robotics. Both have national strategies that highlight brain research as a key area for future innovation. At the same time, they differ in political systems, media environments, and cultural traditions, for example, in how individual rights and the role of the state are understood. Comparing these two countries therefore makes it possible to see how different social and political contexts shape the way ELSI is discussed and addressed. In addition, this case selection is methodologically practical: I have the language proficiency to analyze policy and media materials in both Japanese and Chinese in the original languages, which enables systematic and comparable data collection across the two countries.

From a social-science perspective, analyzing both policy and media is an appropriate and necessary approach. Policies help determine what kinds of research are promoted, what funding is provided, and which areas are defined as socially important (Inui1982). Media, on the other hand, help determine how the public understands those policy choices and scientific developments (Nisbet et al. 2003). When we look at them together, we can see not only what governments and experts intend, but also how these intentions are translated, simplified, or sometimes distorted as they enter public debate. Based on this approach, the article asks the following questions:

- 1) How do Japanese and Chinese science and technology policies position neuroscience and its ELSI?
- 2) How do major newspapers in Japan and China report on neuroscience and its ELSI, and how have these reporting patterns changed over time?

By answering these questions, this article makes three contributions to research on neuroscience governance and ELSI. First, it provides comparative empirical evidence showing that ELSI concerns do not emerge simply as a direct reaction to scientific advances, they become salient through the interaction between state policy

priorities and media discourse. Second, the Japan–China comparison demonstrates that this interaction varies systematically across political and media environments, identifying differences in the timing, dominant themes, and public visibility of ELSI issues. Third, by specifying the conditions under which ELSI becomes prominent, the findings offer a framework for anticipating when and how ethical debates are likely to surface in different national contexts. These results have practical implications for policymakers and professional communities: they support the design of context-sensitive ethical guidelines and communication strategies that are aligned with each country’s institutional and cultural settings.

Literature Review

Neuroscience is the scientific study of the brain and the nervous system, and how they produce our thoughts, feelings, behaviors, and illnesses. As neuroscience has developed, many people have begun to worry not only about what science can do, but also about its wider consequences for society. These concerns are often discussed under the heading of “ELSI”.

One way to understand how societies think about these issues is to look at newspapers and other media. Newspapers do not just report scientific facts; they also choose which topics to highlight, what kind of language to use, and which worries or expectations to emphasize. In this sense, media coverage helps shape how the public understands neuroscience and its risks and benefits. For this reason, many previous studies on neuroscience and ELSI have used newspaper articles as their main data source. A common method in this area is “coding analysis.” In simple terms, researchers first collect a large number of articles, then read them and assign “codes” to each one according to what kind of content it contains. For example, if an article mentions privacy, it might be given the code “privacy” ; if it talks about discrimination or fairness, it might be given the code “justice” and so on. By counting how often each code appears, and in what kinds of articles, researchers can see which ELSI topics are most visible in the media and how they change over time.

Racine (2010) is one of the representative studies in this field. Racine collected 1,256 newspaper articles related to functional magnetic resonance imaging (fMRI) that were published in the United States and the United Kingdom between 1995 and 2004. The articles were obtained from the LexisNexis Academic database using search terms such as “neuro” and “imaging,” as well as “functional magnetic resonance imaging” and “fMRI.” fMRI is a technology that measures changes in blood flow in the brain, and it has often been presented in the media as something that can “read the mind” or make invisible mental states visible. Racine wanted to know how often ethical, legal, and social issues appeared in these articles and what kinds of concerns were mentioned. To do this, the study used a systematic coding analysis. Each article was examined and given codes related to different ELSI themes. The results showed that 28% of all sampled articles referred to at least one ELSI topic. At first glance, this may seem like a relatively high proportion, but it also means that more than 70% of articles did not mention ethical or social concerns at all, even though fMRI is a powerful technology with many potential impacts.

Looking more closely at the distribution of specific topics, Racine reported the following frequencies: discrimination (4.8%), privacy (3.3%), informed consent (2.6%), justice (1.4%), duty and responsibility (1.0%), dignity (0.6%), enhancement (0.5%), eugenics (0.5%), and animal rights (0.4%). In other words, only a small fraction of the total sample dealt with each individual concern. For example, articles that discussed discrimination or privacy were clearly in the minority. This suggests that, during the period studied, media coverage tended to focus more on the scientific and technical aspects of fMRI than on its possible social risks.

A later study by Gilbert et al. (2019) examined media coverage of another important field: brain-computer interfaces (BCIs) and brain-machine interfaces (BMIs). These technologies connect the brain directly with computers or machines, for example to allow a person with paralysis to move a robotic arm or to control a computer cursor using brain activity. Gilbert and colleagues used the FACTIVA database to collect 4,064 English-language articles published between 1993 and 2017. The sample included not only newspapers, but also academic journals, general magazines, blogs and other media. The search terms were “brain-computer interface” and “brain-machine interface.”

Like Racine, Gilbert et al. used coding analysis to investigate how these articles framed BCIs and what kinds of ethical issues were mentioned. They created several coding categories to describe the tone and content of the coverage. For example, articles were coded as “positive,” “overly positive,” “negative,” “overly negative,” “neutral,” “medical applications,” “enhancement,” “future prospects of the technology,” “urgency due to technological progress,” and “ethical issues.” The overall distribution was as follows: “positive” (76.91%), “overly positive” (25.27%), “negative” (1.6%), “overly negative” (0.5%), “ethical issues” (2.7%), “neutral” (12.6%), “medical applications” (61.16%), “enhancement” (26.64%), “future prospects of the technology” (70.64%), and “urgency due to technological progress” (2.8%). These numbers show that most articles talked about BCIs in a positive or even overly positive manner, and that many reports stressed the future potential and medical usefulness of technology. However, only 2.7% of all articles directly referred to ethical issues.

Gilbert et al. also used their coding results to point out problems in media communication. In many articles, especially those coded under “future prospects of the technology” and “medical applications,” the language went beyond what was supported by scientific evidence. Some reports included science-fiction-like predictions or exaggerated expectations, such as dramatic scenarios of human enhancement through BCIs. These narratives can create a gap between what technology can actually do at present and what the public believes it might soon achieve.

Taken together, these prior studies show three important points that are relevant for the present research. First, newspapers and other media play a key role in shaping how people understand neuroscience and its ELSI. They do not simply mirror scientific facts but actively construct optimistic or pessimistic stories around new technologies. Second, even in English-speaking countries where ELSI debates are relatively advanced, explicit discussion of ethical and social issues often appears

only in a minority of articles, while a large share of coverage focuses on scientific progress or technological promise. Third, when the media do talk about ethics, they tend to highlight a fairly similar set of concerns: privacy, discrimination, informed consent, misuse, dignity, and enhancement.

Building on these insights, my study examines how neuroscience and its ELSI are reported not in English-language media, but in Japanese and Chinese newspapers. By comparing the patterns identified in Japan and China with the trends found in previous English-language studies, it becomes possible to see how different media systems and policy environments shape public discussions of neuroscience and its ethical, legal, and social implications.

Method and Conclusion

This study examines two primary objects of analysis—science and technology policy and the media. The policy documents analyzed in this study are publicly available online, and I collected all such documents available by 2025. For the policy analysis, I systematically review Japanese science and technology policies since the 1980s, and Chinese science and technology policy since 2000s to clarify how broader policy trends have shaped neuroscience research and how ELSI has been addressed within these frameworks. In Japan, from the 1980s through the early 2000s, the central priorities of national science and technology policy were the strengthening of basic research and the improvement of research environments. Consistent with this orientation, policies for neuroscience between 1980 and 2006 emphasized the promotion of fundamental research and the expansion of research-support systems. From the late 2000s onward, as national policy increasingly prioritized innovation, brain research was reoriented toward a more comprehensive, strategically coordinated agenda. This shift was marked by the launch of the “Strategic Research Program for Brain Sciences” in 2008, which signaled a transition to a new policy phase. Moreover, the *Third Science and Technology Basic Plan* (2006) explicitly articulated the need to respond to ELSI, which stimulated the establishment of neuroethics research projects and the expansion of related workshops in Japan. In the *First Recommendation* issued in 2009, ELSI was discussed in a more systematic manner alongside the promotion of neuroscience research and development, and its anticipated social applications. After 2010, Japanese brain research entered an era of intensified international competition. In response to the emergence of large-scale brain initiatives in Europe and the United States, Japan adopted a more proactive strategy, culminating in the launch of “Brain/MINDS” (2014) and “Brain/MINDS Beyond” (2018). These programs built on Japan’s comparative strength in primate research while simultaneously positioning the country within global scientific competition.

In contrast, China has positioned science and technology as a driving force of economic development since the 1980s. With the growing emphasis on promoting scientific research in the 1990s, national policy attention increasingly extended to the advancement of neuroscience. Beginning in 1995, the “Revitalizing the Nation through Science and Education” strategy explicitly framed national development through science and technology, setting the enhancement of “indigenous innovation

capacity” as a core objective and accelerating the construction of research infrastructure. Within this policy orientation, public support for neuroscience expanded and policy interest deepened. The *2006 National Medium- and Long-Term Science and Technology Development Plan* designated neuroscience as one of the frontier science and technology fields and outlined future research directions. Since 2016, neuroscience has been continuously incorporated as a priority area in the 13th and 14th *Five-Year Plans*, with institutional arrangements consolidated under a national key-project framework. Responding to the global wave of large-scale brain initiatives, China launched the “China Brain Project” in 2016, aiming not only to strengthen basic research but also to promote applications in disease treatment and AI-related fields.

In China, current neuroscience-related policy documents do not yet articulate a comprehensive response to the ethical, legal, and social implications of brain research. Instead, ethical issues arising in clinical neuroscience research are primarily addressed through the direct incorporation of international ethical guidelines, which are cited and applied within the domestic regulatory framework. While this approach anchors Chinese practice in globally recognized bioethical standards, it also suggests that context-specific ethical concerns related to neuroscience have not yet been fully translated into dedicated national policy provisions.

For the media analysis, this study examines major national newspapers in Japan (Asahi Shimbun, Yomiuri Shimbun, Nihon Keizai Shimbun, Mainichi Shimbun) and representative newspapers in China (People’s Daily, Xinhua News, China News Service, and Guangming Daily). Articles related to neuroscience published between 1980 and 2022 were collected, and a content analysis was conducted to identify the main focal points of neuroscience reporting and ELSI, as well as their historical shifts. The corpus consists of 6,500 Japanese articles and 8,803 Chinese articles. Due to database limitations, however, the Chinese dataset is available only from 2000 onward. Firstly, I conducted a quantitative analysis to examine the yearly trend in the number of articles. A descriptive examination of article volume revealed sharp increases in coverage during periods in both countries: Japanese reporting underwent a significant increase from 2003 to 2009, whereas Chinese reporting grew rapidly after 2016. In each country, the period during which the number of newspaper articles increased sharply corresponded to specific developments in society. In Japan, from around 2000 onward, a so-called “brain boom” led to the widespread dissemination of information related to neuroscience. In China, a similar surge occurred after the launch of the “China Brain Project” in 2016.

Next, I used the quantitative text-analysis software *KH Coder* to carry out two types of analysis: correspondence analysis and coding analysis. In simple terms, the correspondence analysis identified which keywords were associated with each year, and how these associations changed over time. The coding analysis examined what kinds of ELSI-related topics appeared in newspaper coverage. The codes used in the analysis are shown in Table 1.

Coding categories for Japan and China' media (Table 1)	
1. Basic research	7. Applications to education
2. Overseas research	8. Applications to robots/ artificial intelligence
3. Domestic research	9. Applications to medical
4. Celebrity	10. Policy-related
5. Researchers	11. Pseudoscience
6. Politicians	12. ELSI (Ethical, Legal and Social Issues)

For Japanese newspapers, articles from around 1990 to 2000 focused mainly on basic brain science and medical research. After 2000, the topics became more varied. As the total number of articles increased, words such as “games,” “children,” and “education” began to stand out, suggesting that the media increasingly linked brain science to issues involving young people and schools. From 2010 onward, keywords related to putting neuroscience into practice in society, especially in connection with AI and robotics—became more prominent.

In Chinese newspapers, articles from 2008 to 2015 mainly reported on “overseas research developments” and “information about scientific projects.” From 2016 to 2019, words such as “applied development,” “robots and artificial intelligence,” “medical applications,” and “education” appeared more often, showing growing interest in how neuroscience could be used in practice. From 2020 onward, newspapers continued to cover the “China Brain Project”, while also paying more attention to social systems and government policy. In particular, information related to the government’s white paper on building a “moderately prosperous society in all respects” became an important theme from around 2011. When the number of articles increased sharply in 2016, at the time of the official announcement of the “China Brain Project”, the media strongly reflected the project’s goals and priorities.

Overall, these results suggest a clear difference in media logic: Japanese newspapers tend to choose topics in response to social problems and events, while Chinese newspapers report on neuroscience in closer connection with national policies and state-led projects.

Coding analysis gives a more detailed picture of how the media in each country talked about neuroscience. In Japanese newspapers, the 1990s mainly stressed “basic research.” After 2000, there was more reporting on “celebrity” (especially Kenichiro Mogi) and on how brain science could be used in education. Since around 2010, the main focus has shifted toward links with robotics and AI, showing strong interest in how neuroscience can be combined with new technologies in society.

In China, by contrast, the share of articles on “basic research,” “domestic research,” and “overseas research” stayed fairly stable over time, without big changes. However, after the China Brain Project started in 2016, mentions of applications in robotics and AI clearly increased. Terms related to government policy and politicians appeared especially often in 2021 and 2022, suggesting that policy agendas were becoming more visible in media coverage.

Overall, the proportion of ELSI-related coverage remains relatively low in both Japan and China's media, compared with coverage focused on basic research and applications. About ELSI, Japanese newspapers began to report continuously on ethics-related issues tied to neuroscience from around 2005, with "privacy" emerging as the central concern. In Chinese newspapers, ethical topics became more prominent after 2016, and discussions referred to privacy violations, personality rights, health risks related to AI, robot, biology and animal ethics.

ELSI appeared in Japan and China's policy and media		
	Japan	China
Policy	2009～ a more systematic manner relate to application	not yet
Media	2006～ pay more attention to "privacy"	2016～ various issues in the fields of AI, robot and biology

References

- Gilbert, F., Connie P., Jan V., & Wendy G. (2019). Increasing Brain-Computer Interface Media Depictions: Pressing Ethical Concerns, *Brain-Computer Interfaces*, 6(3), 49-70.
- Nisbet, M. C., Dominique, B. and Adrienne, K. (2003). Framing Science: The stem cell controversy in an age of press/politics, *Harvard International Journal of Press/Politics*, 8(2), 36-70.
- Racine, E. (2010). Public understanding of neuroscience innovation and interpretations of neuroscience research. In *Pragmatic neuroethics*, MIT Press, 97-109.
- Inui, S. (1982). 『科学技術政策－その体系化の試み』 . 東海大学出版会, 1-2.

※ This paper is based on my doctoral dissertation.