

Current Policies Surrounding Brain Computer Interfaces: None

Imagine controlling your iPhone through your thoughts. No typing, no clicking buttons, no scrolling. When you want to text a friend, you can just think of the message to send to them, and a device called a Brain-Computer Interface will do all the work for you. There are many different purposes for various types of these Brain-Computer Interfaces (BCI) such as controlling drones for military purposes, trying to cure Alzheimer's disease, and the ability to direct a computer cursor through nothing more than thoughts. Additionally, there are invasive and non-invasive BCIs meaning that they can either be implanted into your brain or used as a headset-looking device. In this article, I will be focusing on policies for the innovation of invasive BCIs. BCIs use sensors that record the brain's activity by capturing signals emitted into machines. Although Brain-Computer Interfaces seem to be an innovation of science-fiction - one that will only be created in the far future - this is actually not the case. There have already been various types of BCIs produced and proven to work which one can find evidence of from merely searching the topic up on YouTube. Despite that only non-invasive BCIs have been tested on humans, minuscule electronic devices have already been implanted into the brains of monkeys and pigs, and all of their results, through public knowledge, have been successful.

Even though this may not be shocking to you seeing that it is the title of this article, it was quite surprising to me that there are no specific policies concerning Brain-Computer Interfaces. Zilch, zero, naught, nada. Nothing. Is that not crazy! These unbelievable, futuristic devices that are intended to be surgically inserted into a person's brain are not yet encountering any extra restrictions or precautions during their development and testing stages. The only laws on these devices are the basic safety requirements necessary to carry out studies on human

subjects for any type of machine, which does require an “investigational device exemption” from the U.S. Food and Drug Administration. I find Elon Musk’s own Neuralink (a BCI creation) to be a curious topic that may call for concern from the public. The company has proudly released videos of a monkey playing a game on a computer screen through the control of a cursor from his thoughts. So now that the public has seen these devices work, what comes next? Is Neuralink allowed to test their devices on humans? After scouring the internet for hours and intensely combing through every source I could find on Brain-Computer Interfaces, I can confidently claim that Neuralink could go ahead and begin their testing on humans if they wished to. In fact, there have already been FDA-approved human trials for Synchron's brain chip, one of Neuralink’s competitors. The federal government is also heavily encouraging and funding research on neural engineering and innovations for this area of focus. In 2016, the Department of Defense program created a new initiative, “Neural Engineering System Design,” which allocated \$60 million “to develop technologies able to record from one million neurons simultaneously in only four years.” The lack of policies affecting the production of Brain-Computer Interfaces and the enticement coming from the United States government allows this innovation to thrive and develop at a rapid pace.

An abundance of people have recommended protection policies for Brain-Computer Interfaces that they believe the government should enact. This is because BCIs clearly impose a threat to a person’s sensitive personal information. After all, the data gathered from them stem directly from the brain. No person (hopefully) wants their innermost thoughts to be shared with the public (or really anyone), and most don’t want their data to be sold to other companies. Quoted directly from Elon Musk: “essentially if you have a whole brain interface, everything that’s encoded in memory you could upload, you could basically store your memories as a

backup and restore the memories. Then ultimately you could potentially download them into a new body or into a robot body. The future's going to be weird." Brain-Computer Interfaces will create extreme security risks to humans no matter what their purposes are, and especially as these machines continue to advance. For all of these reasons, lawmakers must immediately begin the discussion about how to put protections in place for BCI users, and what these rules will entail. One such person to propose "principles for mitigating privacy risks" (Greenberg and Ringrose) was Katelyn Ringrose, the Christopher Wolf Diversity Law Fellow. Following are some of her most important recommendations: to ensure that BCI users have control over turning their devices on and off, to make it mandatory for BCI businesses to state the reasons for any neuro information they collect, to get consent from the user for utilizing this data for any other purposes, to form strong security initiatives to secure any neuro information that could be gathered from BCIs and finally stop any possible meddling of the actual machines from an external source. These proposed defenses are great starts, but still not enough to cover the larger risk BCIs present. Ringrose's protections focus more on the security of the neuro information than the actual BCI user. The FDA promised that "unique controls will be enacted for devices of this type [Brain Computer Interfaces] to provide reasonable assurance of safety and effectiveness for these devices" (Billauer), but where are these protections now that BCIs have already been developed?

Brain-Computer Interfaces will greatly impact and of course extremely advance society, but the rapid growth of this innovation and the speed at which they are currently being approved by the government is frightening. "The global brain-computer interface market size was valued at \$1,488.00 million in 2020, and is projected to reach \$5,463.00 million by 2030, growing at a [compound annual growth rate] of 13.9% from 2021 to 2030" (Rake and Wadodkar). This device

will be life-changing for so many types of people, especially those impacted by brain disorders or physical disabilities. For example, a stroke victim who lost the capability to produce words in a logical pattern could, in theory, get the Neuralink inserted into their brain and then speak through thoughts as they are transmitted to a computer or smartphone. I truly believe that if one of these conditions ever applied to me, I would hope to obtain a Brain-Computer Interface. However, I would only ever consider a BCI if and when severe policies concerning them are in place. These regulations would have to include extremely rigorous testing that goes way beyond the basic safety laws that are currently in place for most machines.

Another troubling thought is about how Brain-Computer Interfaces will develop in the future and endanger human fundamental rights such as freedom of expression and of thought. If people know their thoughts are being monitored and recorded, would they change their personal life, emotions, and beliefs? As Alžběta Krausová, head of the Center of Innovations and Cyberlaw Research at the Institute of State and Law of the Czech Academy of Sciences wrote, “an emotional life of a person and her identity as a whole could be seriously impacted” because “the social pressure would force individuals to use their minds in a specific manner” (Krausová). Although the lack of policies surrounding Brain-Computer Interfaces fosters this innovation, the risks of not protecting users of these devices’ privacy and physical safety outweigh the benefits significantly, suggesting that strict laws must be created. I am all for advancements in science and am fascinated by artificial intelligence, but at what point is technological advancement not worth the potential loss of humanity as we know it throughout this development?

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