Neuro-Doping (tDCS): The Rise of a Loophole to Get around Anti-Doping Policy

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The purpose of this study is to provide an overview of the emerging neuro-doping technology and its ability to enhance athletic performance, and to examine the physical and ethical risks associated with the technology. This study also suggests that sports governing bodies charged with anti-doping regulation begin to consider prohibiting the application of electrical stimulus to the brain as a means of physical manipulation aimed at enhancing performance.

For a long time, there has been many athletes who aim to improve their levels of performance quickly so as to take advantage of their rankings or their positions within their respective sports. This is why doping has evolved at a fairly constant rate (Morente-Sánchez & Zabala, 2013). At present, the World Anti-Doping Agency (WADA), the most influential anti-doping policy decision-making institution, has banned various means of doping, including drugs, blood, and even gene doping (Davis, 2013). However, an emerging technology that involves electronic stimulus of the brain, and has been dubbed “neuro-doping” (Davis, 2013), is being used as a substitute to existing doping methods that are listed on the WADA’s prohibited list. According to Reardon (2016), the U.S. Ski and Snowboard Association (USSA), and a company that makes a product for improving athletic ability among elite athletes using neuro-technology, are testing whether electronic stimulus to the brain could upgrade national ski-jumpers’ capabilities during performance through a new device worn as a headset. This test concluded that Transcranial Direct-Current Stimulation (tDCS) improves the athletes’ jumping force and their coordination when compared to the force and coordination of the control group (Reardon, 2016).

This treatment, tDCS, is described as a non-invasive, painless brain stimulation treatment or technique that delivered an electrical stimulus to a specific part of the brain (Johns Hopkins Medicine, 2016). Several researchers have found that tDCS is effective in treating a variety of neurological and psychiatric disorders such as depression, stroke, Parkinson’s disease, and chronic pain (Benninger et al., 2010; Arul-Anandam & Loo, 2009; Nowak et al., 2010). Also, this technique could help increase attention span, enhance memory, and improve cognitive ability (Chi & Snyder, 2011; Davis, 2013; Iuculano & Kadosh, 2013), and it could also improve sports performance through a change in brain activity affecting various aspects of mental performance such as “motor learning, enhanced muscular strength or reduced fatigue, or even changes to mental state or concentration” (Davis, 2013, p. 649). These benefits are crucial for athletes at the moments that determine victory or defeat within top-tier competitions. One such moment has resulted in controversy and many questions “about the fairness of brain-based performance enhancement” (Maney, 2016). If the neuro-doping technique has a complete stimulation parameter, then it might become a new and complete doping technique. And, as a result, athletes who hope to develop their performance in a short time would gravitate toward tDCS as a means of complete doping because they could use it without experiencing the risky side effects associated with physical or chemical doping, and they could use it without violating the regulations implemented by the sport anti-doping governing bodies, WADA or the U.S. Anti-Doping Agency (USADA).

Recently, however, several problems both physical and ethical in nature have become associated with tDCS. When it comes to physical problems of this technology, it may result in a number of possible serious risks. Sellers et al. (2015) found that tDCS have a significant detrimental impact on IQ scores. In addition, Nitsche et al. (2008), a group of well-known neurologists, claimed that electronic brain stimulation is indeed associated with various potential health risks such as (1) tissue damage as a result of pulsed electrical stimulation; (2) the creation of electrochemically generated toxins; (3) the generation of electrode dissolution product; (4) skin damage via electronic current density; (4) brain damage via deposition of charge and electrolysis, and modification of amino acids and proteins; (5) damage to vulnerable parts of the brain (e.g., skull defect, foramina, open fontanelles, fissures in infants); (6) trivial side effects (e.g., skin itching, headache, fatigue, and dizziness); (7) neurologic diseases (e.g., epilepsy, acute eczema, epileptic seizures); and (8) unintended or adverse effects. tDCS would result in potential risks and would not be a completely
safe way to improve sporting performance, despite the suggestion that “these, of course, would provide further potential avenues for improved performance” (Banissy & Muggleto, 2013).

In the aspect of ethical issues, if some players use tDCS to help them win, would their opponents feel that the wins were justified? It is likely that many opponents would resort to suing the players who were doped via electrical stimulation to the brain. As such, policymakers at anti-doping institutions must be proactive in modifying or reinforcing regulations that guide athletes, athlete support personnel, and law enforcers in terms of the validity of such electronic brain stimulation techniques that have the physical and ethical issues. Further, these policymakers (i.e., WADA) must act quickly.

The World Anti-Doping Association (WADA) is the most well-known and influential anti-doping agency. This agency was established in November 10, 1999, under the International Olympic Committee (IOC), in order to fight against doping (WADA, 2016). In accordance with its core values, the organization serves to “develop policies, procedures and practices that reflect justice, equity and integrity” (WADA, 2016). If neuro-doping is officially approved as a means of performance enhancement for elite-athletes, then it would serve to undermine the values set forth by organizations such as WADA and the International Olympic Committee, both of which aim for fairness and equity. In the agency’s 2016 prohibited list, the collection of prohibited substances is accumulative and expansive. However, neuro or brain doping has not been listed among the collection, which includes only the following methods of manipulation: (1) blood and blood component; (2) chemical and physical style; (3) gene doping, considered as a potential doping method. Moreover, “there is no known way to detect reliably whether or not a person has recently experienced brain stimulation” (Davis, 2013, p. 650). By arousing the agencies’ attention and establishing an abundance of evidence in research, WADA should impose a new policy and develop a new doping test that will effectively detect the application of neuro-doping.

Taken together, this technique is still in the experimental stage, research is incomplete with regard to the unexpected critical side effects one may experience from either regular use or abuse of electronic brain stimulation. Consequently, this new technique should be restricted from the sports world as soon as possible so as to maintain fairness in sports and soundness among athletes’ bodies. In addition, the world’s regulatory sports bodies tasked with anti-doping policy must begin considering how best to address performance enhancement through neuroscience in the sports world. Finally, because new enhancement techniques constitute cheating, as they break existing or unwritten rules and are unfair, new official rules aimed at preventing the use of these new techniques must be established (Schemer, 2008). If these actions are not taken, then additional loopholes will be found and more means of doping will be developed.