Brain Stimulation xxx (2018) 1–2

Contents lists available at ScienceDirect

Brain Stimulation

journal homepage: http://www.journals.elsevier.com/brain-stimulation

Case report of syncope during a transcranial direct current stimulation experiment in a healthy adult participant

Dear Editor:

We report the following syncope case observed during a transcranial direct current stimulation (tDCS) study. There are no known cases of syncope during tDCS with human participants [1,2]. The participant was a healthy, 23 year old female. In the prescreening questionnaire she disclosed no history of prior closed head injury, loss of consciousness, family history of epilepsy, or history of seizures or febrile seizures [3,4]. The only medication that she reported taking was the oral contraceptive Lutera. On the day of the event, the participant reported no additional risk factors such as sleep pattern changes or deprivation, changes in food and water consumption, medication changes, occult drug use, or high doses of caffeine.

Cathodal tDCS stimulation was delivered over the right temporoparietal junction (CP6) with an intensity of 2mA using a 4×1 ring electrode montage. We used a neuroConn DC-Stimulator MC (München, Germany) to administer the stimulation. The participant had not previously undergone tDCS.

The setting was an on-campus research lab that conducts non-clinical decision making experiments. The participant was seated on a chair with her back supported and both feet on the floor. The event occurred about 1 min into the stimulation procedure. The participant informed the experimenters that she felt nauseous and dizzy, and the experimenters asked the participant if she was feeling all right and if she would like to continue. The participant responded that she wanted to stop the procedure and the experimenters terminated the stimulation immediately. The participant fainted a few seconds after the stimulation was discontinued. The time elapsed from the first moment the participant indicated that she felt nauseous and dizzy to the moment that the participant lost consciousness was approximately 30 seconds. The experimenters caught the participant to prevent injury and laid her down on the floor. The experimenters noted no obvious physical symptoms besides loss of consciousness. After about 10 seconds, the participant revived, sat up, and responded when spoken to. The participant was able to identify correctly where she was, and reported that she believed that she had fallen asleep. After the participant regained consciousness the experimenters noted the pallor in her face but did not check pulse and blood pressure. After about 30 minutes of observation with no symptoms of nausea or dizziness the participant left the laboratory. She was withdrawn from the study and did not undergo further tDCS testing.

In a follow-up survey, the participant informed the experimenters that she experienced anxiety before the stimulation related to the syringes used to fill the electrode holders with electroconductive gel during the application of the electrodes. She also reported that, on another occasion, she had fainted after reading a description of open-heart surgery and that she had always found medical environments disturbing.

Although we are not clinicians, we believe that the most likely diagnosis is syncope (see the syncope video on the Brain Stimulation website http://www.brainstimjrnl.com/content/mmc_library). We believe that this event was most likely not a case of neurogenic seizure, since for a healthy participant with no neurologic disorder or use of psychotropic substances, it seems unlikely that this event resulted from brief tDCS stimulation. No twitches or jerks that might indicate myoclonic muscle contractions were observed during the event [5]. In addition, the participant's rapid recovery of consciousness, without apparent confusion, is more consistent with syncope than seizure [6,7].

In the IRB approved prescreening questionnaire the participant answered “No” to the question “Have you ever suffered from febrile convulsions in infancy or had recurrent fainting spells or syncope?” The question might appear confusing to participants without a medical background. After this incident, we changed the questionnaire by separating the part of the question about febrile convulsions in infancy from the question about fainting spells. We also added the question “Have you ever fainted or felt that you might faint during a medical or clinical procedure, such as when having blood drawn or having your blood pressure taken?” to the prescreening questionnaire to help minimize the risk of future incidence.

Declarations of interest

None.

References

[1] Matsumoto H, Ugawa Y. Adverse events of tDCS and tACS: a review. Clin. Neurophysiol. Pract. 2017;1(2):19–25. https://doi.org/10.1016/j.cnp.2016.12.003.
[2] Brunoni AR, Amadera J, Berbel B, Volz MS, Rizzerio BG, Fregni F. A systematic review on reporting and assessment of adverse effects associated with transcranial direct current stimulation. Int J Neuropsychopharmacol 2011;14(8):1133–45. https://doi.org/10.1017/S1461145710001690.
[3] Antal A, Alekseichuk I, Bikson M, Brockmöller J, Brunoni AR, Chen R, et al. Low intensity transcranial electric stimulation: safety, ethical, legal regulatory and application guidelines. Clin Neurophysiol 2017;128(9):1774–809. https://doi.org/10.1016/j.clinph.2017.06.001.
[4] Bikson M, Datta A, Elwassif M. Establishing safety limits for transcranial direct current stimulation. Clin Neurophysiol 2009;120(6):1033–4. https://doi.org/10.1016/j.clinph.2009.03.018.
[5] Hoefnagels WA, Padberg GW, Overweg J, Van der Velde EA, Roos RA. Transient loss of consciousness: the value of the history for distinguishing seizure from syncope. J Neurol 1991;238(1):39–43. https://doi.org/10.1007/BF00319709.
[6] Thijs RD, Bloem BR, van Dijk JG. Falls, faints, fits and funny turns. J Neurol 2009;256(2):155–67. https://doi.org/10.1007/s00415-009-0108-y.

https://doi.org/10.1016/j.brs.2018.06.008
1935-861X/

[7] Sheldon R, Rose S, Ritchie D, Connolly SJ, Koshman ML, Lee MA, et al. Historical criteria that distinguish syncope from seizures. J Am Coll Cardiol 2002;40(1):142–8. https://doi.org/10.1016/S0735-1097(02)01940-X.

Flora Li, Sheryl Ball
Department of Economics, Virginia Tech, Blacksburg, VA, USA

Benjamin Katz
Department of Human Development and Family Science, Virginia Tech, Blacksburg, VA, USA

Alec Smith*
Department of Economics, Virginia Tech, Blacksburg, VA, USA

* Corresponding author. 880 West Campus Drive, Mail Code 0316, Blacksburg, VA, 24061, USA.
E-mail address: alecsmith@vt.edu (A. Smith).

19 June 2018
Available online xxx