Brain Stimulation 15 (2022) 678–679

Contents lists available at ScienceDirect

Brain Stimulation

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

Noninvasive electrical stimulation for psychiatric care in Down syndrome

To the editors,

Unexplained cognitive deterioration and rapid regression with disabling catatonic features have been described in young individuals with Down Syndrome [1]. This regression with catatonic features, often attributed to depression or early-onset Alzheimer's disease, is under-recognised and there is no clear evidence-based guideline for its optimal and safe management, leaving much room for the development of alternative and safe strategies. Indeed, although several usual antidepressant treatments seem to be effective in patients with Down Syndrome with depressive and catatonic symptoms, they are often poorly tolerated (e.g., the occurrence of drugs adverse effect is greater than in the general population), not easily accessible (e.g., electroconvulsive therapy) or not feasible (e.g., psychotherapy based on langage is not adaptated in patients with intellectual disabilities and langage difficulties). Recently, transcranial direct current stimulation (tDCS) has been proposed as a safe strategy to decrease symptoms and improve cognitive functioning in patients with numerous psychiatric symptoms [2], including catatonia [3]. Here, we propose to investigate for the first time the safety and the clinical efficacy of add-on tDCS in patients with Down Syndrome presenting with treatment-resistant depressive and catatonic symptoms.

After providing a written informed consent following a full and fair description of the procedure to the patients and their legal representatives (parents), two patients with Down Syndrome received 10 sessions of tDCS during a 14-day full-time hospitalization (two sessions per day, 20 min, 2mA, ramp up/down 30 sec, from Monday to Friday, see [4]). The anode (7×5 cm) was placed over the left and the cathode (7×5 cm) over the right dorsolateral prefrontal cortex, respectively (see [5]). The location of the electrodes was determined individually according to the Beam F3 algorithm [6]. The patients presented with regression and catatonic features, severe treatment-resistant depressive symptoms with mutism, food refusal, psychomotor impairments, loss of autonomy and insomnia that led to full-time hospitalization. In both cases, several lines of treatment combining selective serotonin reuptake inhibitors (SSRI), benzodiazepines and antipsychotics had been conducted at effective doses without significative improvement or with serious adverse events. Usual treatments combining aripiprazole and SSRI remained unchanged for at least 8 weeks before tDCS in both patients. Catatonic symptoms and cognitive functioning were evaluated before, immediately after the 10 tDCS sessions, and one month later using the Bush Francis Catatonia Rating Scale (BFCRS) and the Severe Impairment Battery (SIB), respectively.

The first patient was a 22-year-old man with disabling depressive and catatonic symptoms even under treatment (paroxetine 40 mg/day, aripiprazole 4 mg/d). After tDCS, catatonic symptoms decreased by more than 50% (BFCRS from 14 to 6). The BFCRS remained lower than at baseline at the 1-month follow-up (BFCRS = 11). An improvement in cognitive functioning was also observed with a score at the SIB increasing from 24 at baseline to 29 after the 10 tDCS sessions and reaching 34 at one month follow-up.

The second patient was a 27-year-old woman receiving mirtazapine 30 mg/d combined with aripiprazole 2 mg/d. A significant improvement in catatonic symptoms was also observed after the 10 sessions of tDCS (BFCRS from 12 to 7); the effect being greater 1 month after the end of the intervention (BFCRS = 4). The cognitive functioning evaluated by the SIB increased from 40 to 44 at follow-up.

In both cases, tDCS allowed patients to leave the hospital, recovered from depressive and catatonic symptoms and returned to baseline functioning in their families. The treatment was well tolerated. Only transitory itching sensation and redness under the electrode location were observed after the end of the sessions. A transitory skin rash that disappeared within the first hour after the end of the first stimulation session was observed in the first patient.

Because of its effectiveness, low-cost, little to no evidence of adverse effect including induced-seizure, easy accessibility and the possibility of home-based administration, tDCS could be a suitable and generalizable approach to addressing the mental health and psychiatric symptoms in patients with Down Syndrome.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] Santoro SL, Cannon S, Capone G, Franklin C, Hart SJ, Hobensack V, Kishnani PS, Macklin EA, Manickam K, McCormick A, Nash P, Oreskovic NM, Patsiogiannis V, Steingass K, Torres A, Valentini D, Vellody K, Skotko BG. Unexplained regression in Down syndrome: 35 cases from an international Down syndrome database. Genet Med 2020;22(4):767–76.

[2] Fregni F, El-Hagrassy MM, Pacheco-Barrios K, Carvalho S, Leite J, Simis M, Brunelin J, Nakamura-Palacios EM, Marangolo P, Venkatasubramanian G, San-Juan D, Caumo W, Bikson M, Brunoni AR, Neuromodulation Center Working Group. Evidence-based guidelines and secondary meta-analysis for the use of

https://doi.org/10.1016/j.brs.2022.04.012

transcranial direct current stimulation in neurological and psychiatric disorders. Int J Neuropsychopharmacol 2021;24(4):256–313.
[3] Hansbauer M, Wagner E, Strube W, Röh A, Padberg F, Keeser D, Falkai P, Hasan A. rTMS and tDCS for the treatment of catatonia: a systematic review. Schizophr Res 2020;222:73–8.
[4] Brunelin J, Mondino M, Gassab L, Haesebaert F, Gaha L, Suaud-Chagny MF, Saoud M, Mechri A, Poulet E. Examining transcranial direct-current stimulation (tDCS) as a treatment for hallucinations in schizophrenia. Am J Psychiatr 2012;169(7):719–24.
[5] Brunoni AR, Moffa AH, Sampaio-Junior B, Borrione L, Moreno ML, Fernandes RA, Veronezi BP, Nogueira BS, Aparicio LVM, Razza LB, Chamorro R, Tort LC, Fraguas R, Lotufo PA, Gattaz WF, Fregni F, Benseñor IM, ELECT-TDCS Investigators. Trial of electrical direct-current Therapy versus escitalopram for depression. N Engl J Med 2017 Jun 29;376(26):2523–33. https://doi.org/10.1056/NEJMoa1612999.
[6] Mir-Moghtadaei A, Caballero R, Fried P, Fox MD, Lee K, Giacobbe P, Daskalakis ZJ, Blumberger DM, Downar J. Concordance between BeamF3 and MRI-neuronavigated target sites for repetitive transcranial magnetic stimulation of the left dorsolateral prefrontal cortex. Brain Stimul 2015;8(5):965–73.

Jerome Brunelin*, Ondine Adam
Centre Hospitalier Le Vinatier, F-69500, Bron, France

Université Claude Bernard Lyon 1, Lyon University, F-69100, Villeurbanne, France

PSYR2 Team, Lyon Neuroscience Research Center, INSERM, U1028, CNRS, UMR5292, F-69000, Lyon, France

Emilie Favre
Centre Hospitalier Le Vinatier, F-69500, Bron, France

Excellence Center for Autism and Developmental Disorders iMIND & Team "Disorders of the Brain" Marc Jeannerod Institute, F-69000, Lyon, France

Stéphane Prange
Hôpital Neurologique, Hospices Civils de Lyon, F-69000, Lyon, France

Université Claude Bernard Lyon 1, Lyon University, F-69100, Villeurbanne, France

Elodie Zante, Caroline Demily
Centre Hospitalier Le Vinatier, F-69500, Bron, France

Université Claude Bernard Lyon 1, Lyon University, F-69100, Villeurbanne, France

Excellence Center for Autism and Developmental Disorders iMIND & Team "Disorders of the Brain" Marc Jeannerod Institute, F-69000, Lyon, France

* Corresponding author.
E-mail address: jerome.brunelin@ch-le-vinatier.fr (J. Brunelin).

11 April 2022
Available online 22 April 2022