

# The efficacy of transcranial direct current stimulation (tDCS) in the treatment of depression and brain functional changes compared to venlafaxine

<b>Submission date</b> 23/09/2015	<b>Recruitment status</b> No longer recruiting	<input checked="" type="checkbox"/> Prospectively registered <input checked="" type="checkbox"/> Protocol
<b>Registration date</b> 02/10/2015	<b>Overall study status</b> Completed	<input type="checkbox"/> Statistical analysis plan <input checked="" type="checkbox"/> Results
<b>Last Edited</b> 10/10/2022	<b>Condition category</b> Mental and Behavioural Disorders	<input type="checkbox"/> Individual participant data

## Plain English summary of protocol

### Background and study aims

Major depressive disorder (MDD), often referred to as depression, is one of the most common mental health conditions in the world. The symptoms of MDD can vary greatly from person to person, but they generally include low mood, problems with sleeping and/or eating, and a general loss of interest in life. Treatment often relies heavily on antidepressant medications, which work by increasing the activity and levels of a group of chemicals in the brain (neurotransmitters). Venlafaxine is considered to be one of the most effective antidepressant medications on the market, and is regularly prescribed in cases of severe depression. Although many people benefit from antidepressant treatment, it does not work for everyone and so other treatment options are essential. Transcranial direct current stimulation (tDCS) is a treatment which involves using very mild electrical current to trigger activity the brain. When receiving tDCS treatment, sticky pads which conduct electricity (electrodes) are placed on the scalp which stimulates specific parts of the brain. The aim of this study is to compare the effects of venlafaxine and tDCS on brain activity and the treatment of depression.

### Who can participate?

Right handed adults suffering from major depressive disorder who have not responded to previous treatment.

### What does the study involve?

In part one of the study, participants are randomly allocated into one of two groups. After one week of not having receiving any treatment for depression, participants are started on a four week treatment plan. Those in group one are treated with venlafaxine and those in group two are treated with tDCS. All participants have their brain activity measured at the start and end of the four week treatment period using brain scanning techniques. After the four week treatment period, participants who have responded to their treatment move onto part two of the study. In

part two of the study, participants continue the treatment plan that they were started on in part one of the study for a further eight weeks. These participants then have their brain activity measured again at the end of the eight week period.

What are the possible benefits and risks of participating?

A possible benefit of participant in the study is the improvement of depressive symptoms. There is no substantial risk of participating, other than the possibility of medication side effects or side effects of tDCS. tDCS is generally well tolerated, the main side effects are itching, tingling, headache or burning sensation.

Where is the study run from?

National Institute of Mental Health (Czech Republic)

When is the study starting and how long is it expected to run for?

October 2015 to April 2019 (updated 09/10/2019, previously: December 2019)

Who is funding the study?

Ministry of Health (Czech Republic)

Who is the main contact?

Dr Martin Bares

## Contact information

**Type(s)**

Scientific

**Contact name**

Dr Martin Bares

**Contact details**

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## Additional identifiers

**EudraCT/CTIS number**

2015-001639-19

**IRAS number**

**ClinicalTrials.gov number**

**Secondary identifying numbers**

AZV CR 15-29900A

## Study information

**Scientific Title**

The efficacy of transcranial direct current stimulation (tDCS) in the treatment of depression and brain functional changes compared to venlafaxine: A four week, double-blind, parallel, randomized study with an eight week, open-label, follow-up study

**Study objectives**

1. To compare efficacy and tolerability of transcranial direct current stimulation (tDCS) and venlafaxine in the acute treatment of depressive disorder and relapse prevention
2. To identify predictors of response to both interventions and map functional brain changes during the treatment (fMRI, QEEG cordance, LORETA)

**Ethics approval required**

Old ethics approval format

**Ethics approval(s)**

Ethic Committee of the National Institute of Mental Health (Czech Republic), 17/06/2015, ref: 62 /15

**Study design**

1. Single-centre double-blind randomised parallel trial
2. Open-label follow-up study

**Primary study design**

Interventional

**Secondary study design**

Randomised parallel trial

**Study setting(s)**

Hospital

**Study type(s)**

Treatment

**Participant information sheet****Health condition(s) or problem(s) studied**

Depression

**Interventions**

Part one: Single-centre double-blind randomised parallel trial

Following an initial wash-out period (5-7 days), eligible subjects will receive 4-week treatment. They will be randomly allocated according to permuted block design with a fixed block size 4, in a 1:1 ratio (no stratification) to either tDCS + placebo group or venlafaxine + placebo stimulation group. Both groups will also receive hydroxyzine (maximum 100 mg/day) for anxiety and zolpidem for insomnia during the study. The continuation of benzodiazepine medication will be allowed in unchanged dosage in patients who used them before the study. Participants who do not respond to treatment in the acute phase of study will be treated as usual according to their psychiatrists.

#### Group 1: Venlafaxine extended release (ER) + placebo stimulation

Patients assigned to venlafaxine treatment will take 75mg of venlafaxine ER for the first 5 days of the study period. From day 6 onward, the dose could be increased every 5 days by 75 mg to maximal dose (375mg/day) according to the clinical judgment of the attending physician. Patients who will not tolerate at least 150mg of venlafaxine ER/day will be excluded from the study. The placebo stimulation will be delivered in the same anatomical location with identical stimulation parameters as real stimulation but the device will be turned-off after 1 minute of active stimulation.

#### Group 2: Transcranial direct current stimulation (tDCS) + placebo medication

The tDCS montage will comprise placement of the anode over the F3 area and cathode over the F4 area (corresponding to the left and right DLPFC according to 10-20 EEG system). Rubber electrodes will be inserted in 25-cm<sup>2</sup> saline and gel soaked sponge and fixed with a headband to stimulation area. Each week day (altogether 20 sessions), subjects will receive a direct current of 2mA (current density 0.08 mA/m<sup>2</sup> for 30 min/ day). Placebo capsules will be administered at the same schedule as Venlafaxine ER.

#### Part two: Open label follow-up study

Participants who finish the acute phase of the study and achieve response to tDCS or venlafaxine are enrolled into the follow up study, lasting for a period of 8 weeks. There is no change in allowed concomitant treatment with exception of possibility to reduce benzodiazepines. At the end of the study period, participants are subsequently treated according to clinical judgment of the attending psychiatrist.

#### Group 1: Venlafaxine group

Participants continue the venlafaxine treatment in unchanged daily dose.

#### Group 2: TDCS group

Participants receive stimulated once a week with the same parameters of stimulation (current, duration of stimulation etc.) as in the acute phase study.

For both groups, EEG data (10 minutes in duration) will be recorded at baseline and after first and fourth week of acute treatment and at the end of follow up phase of study (week 12) under the standard condition (semi-recumbent position, eyes closed) with 21 surface electrodes placed according to the international 10/20 system. fMRI measurements will be performed on a 3 Tesla scanner before the start of study and at the end of acute study (week 4).

### Intervention Type

Mixed

### Primary outcome measure

Double-blind study:

1. Response to treatment with both interventions measured as  $\geq 50\%$  reduction of MADRS (Montgomery and Åsberg Rating Scale) score at the end of the study (week 4)
2. The number of participants who drop-out from the study for any reason in either study group during the duration of the study
3. The ratio of occurrence of a priori defined predictor (reduction of prefrontal cordance value) in responders and non-responders to both interventions measured after the first week of treatment

Open-label, follow-up study:

The number of patients suffering from relapse of depression defined as the score  $\geq 20$  points in

the MADRS in combination with score 4 or more points in the CGI at the time of follow-up visits or need of change of antidepressant treatment due to substantial worsening of clinical status during the duration of the open-label follow-up study (8 weeks)

### **Secondary outcome measures**

Double-blind study:

1. Remission rate for both interventions measured as MADRS score  $\leq 10$  points at the end of the study (week 4)
2. The distribution of current density and its change measured by sLORETA (low resolution electromagnetic tomography) and the analysis of functional connectivity measured by eLORETA (exact low resolution brain electromagnetic tomography) in responders and non-responders to both interventions at baseline, week 1 and the end of the study (week 4)
3. Functional connectivity in rsfMRI in responders and non-responders to both interventions (tDCS, venlafaxine) and its change measured at baseline and week 4 of the study

Open-label, follow-up study:

1. The distribution of current density measured by sLORETA (low resolution electromagnetic tomography) and the analysis of functional connectivity measured by eLORETA (exact low resolution brain electromagnetic tomography) in participants of the open-label, follow-up study (responders in the double-blind study) treated with both interventions at the beginning and the end of the study

### **Overall study start date**

01/10/2015

### **Completion date**

24/04/2019

## **Eligibility**

### **Key inclusion criteria**

1. Patients suffering from major depressive disorder (recurrent or single episode) diagnosed according to Diagnostic and Statistical Manual of the American Psychiatric Association-IV. revision criteria, confirmed using The Mini-International Neuropsychiatric Interview - M.I.N.I., Czech version 5.0.0
2. Patients fulfilling at least Stage I criteria for resistant depression according to Thase and Rush ( $\geq 1$  previous, unsuccessful, adequate, antidepressant treatment)
3. The mental ability to understand and sign Informed Consent Form
4. The score in the Montgomery and Åsberg Rating Scale (MADRS)  $\geq 25$  and the score in Clinical Global Impression  $\geq 4$
5. Inpatients in the double-blind phase of treatment
6. Age between 18 and 65 years
7. Right handedness

### **Participant type(s)**

Patient

### **Age group**

Adult

### **Lower age limit**

18 Years

**Sex**

Both

**Target number of participants**

60

**Total final enrolment**

57

**Key exclusion criteria**

1. Psychiatric comorbidity on axis I and II according to DSM IV in the 6 months before enrollment to the study
2. Psychotic, bipolar disorder or dementia in the history
3. Contraindications of venlafaxine treatment according to SPC
4. Contraindications of MRI (metallic plates in the head, applied pacemaker or other electronic stimulation devices, etc.)
5. Contraindications of tDCS (skin disease, superficial injury and fracture or infraction of skull in the stimulation area, epilepsy, metallic plates in the head)
6. Pregnancy or breast-feeding
7. Patients with severe somatic disorders (cardiovascular disease, neoplasms, endocrinology disorders etc.) that could be associated with depression due to somatic diseases
8. Patients treated with electroconvulsive therapy less than 3 months before enrollment or suffering from neurologic disorder (e.g., epilepsy, head trauma with loss of consciousness) and patients using any treatment which can strongly affect EEG
9. Application of other concomitant medication that is not allowed in protocol (e.g. antipsychotics, mood stabilizers etc.)
10. Unsuccessful treatment with venlafaxine or tDCS in the current episode of depressive disorder
11. Fluoxetine treatment before the enrollment to the study

**Date of first enrolment**

01/04/2019

**Date of final enrolment**

01/09/2019

## **Locations**

**Countries of recruitment**

Czech Republic

**Study participating centre**

**National Institute of Mental Health**

Topolova 748

Klecany

Czech Republic  
250 67

## Sponsor information

### Organisation

Ministry of Health, Czech Republic

### Sponsor details

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### Sponsor type

Government

### ROR

<https://ror.org/00y6khe77>

## Funder(s)

### Funder type

Government

### Funder Name

Ministry of Health, Czech Republic

## Results and Publications

### Publication and dissemination plan

The article or articles with the results of the clinical trial would be published by at the end of 2019 and the results will be also presented at international psychiatric congresses i.e. European Psychiatric Congress 2020

### Intention to publish date

31/12/2020

### Individual participant data (IPD) sharing plan

Not provided at time of registration

## IPD sharing plan summary

Not expected to be made available

### Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
<a href="#">Results article</a>	results	23/10/2019	02/04/2020	Yes	No
<a href="#">Protocol file</a>			10/10/2022	No	No