Non-invasive brain stimulation in adolescents with Anorexia Nervosa: preliminary data of a randomized, double blind, placebo-controlled trial

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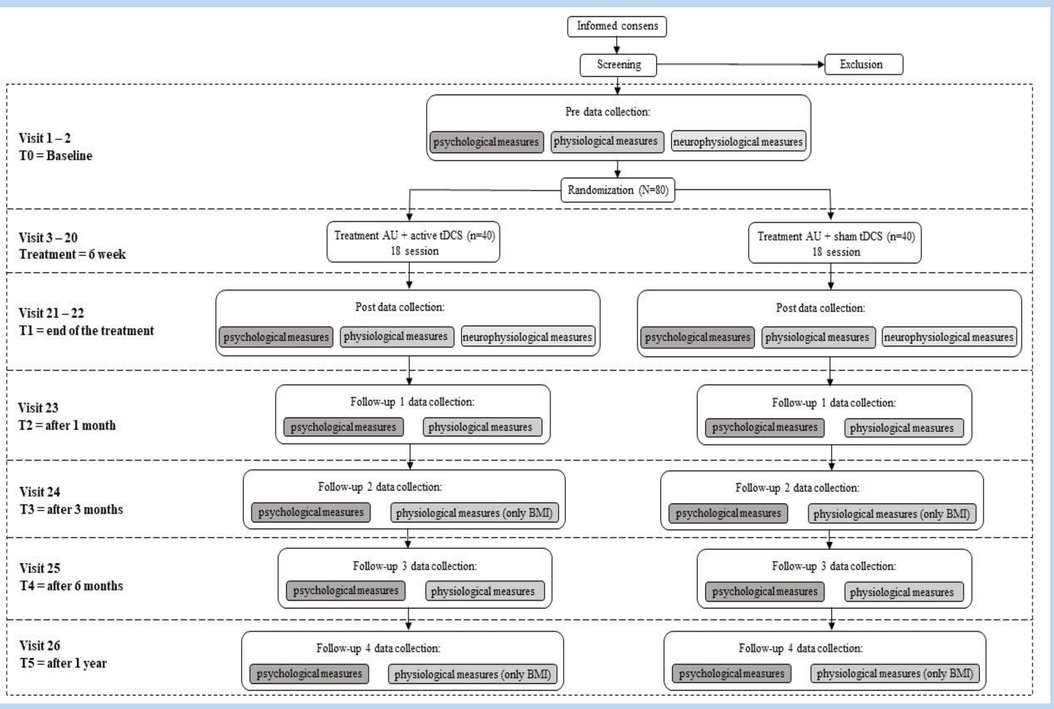
INTRODUCTION

Anorexia Nervosa (AN) is characterized by pathological eating behaviors and body image disturbance. Current psychological and pharmacological treatments for AN provide only moderate effective support and there is an urgent research need to improve therapies, especially in developing age. Neuromodulation have suggested to have the potential for reducing AN symptomatology [1,2], via targeting brain alterations[3], such as hyperactivity of right prefrontal cortex (PFC). We applied transcranial direct current stimulation (tDCS) to the PFC to improve the clinical outcome of a traditional treatment in adolescents with AN. We also investigated brain mechanisms and biomarkers' changes acting in AN after tDCS treatment, using an integrative approach that combine TMS with the EEG.

MATERIALS AND METHODS

Study protocol



Treatment

- **tDCS (active or sham) + treatment as usual**

-18 sessions – 20 minutes – 6 weeks
- anode F3/cathode F4

- **psychiatric, nutritional and psychological support**

Psychological measures

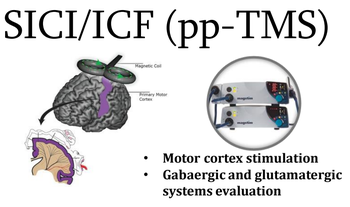
- AN symptoms (EDI-3; EAT-26; BUT; FAL)
- Behavioural and emotional symptoms (CBCL/6-18)
- Anxiety (MASC-2)
- Depression (CDI-2)

Physiological measures

- BMI
- Blood exams
- Cortisol Awakening Response

Neurophysiological measures

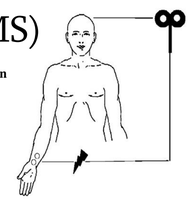
SICI/ICF (pp-TMS)



- **Motor cortex stimulation**
- **Gabaergic and glutamatergic systems evaluation**

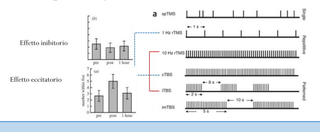
SAI (pp-TMS)

Sensori-motor integration

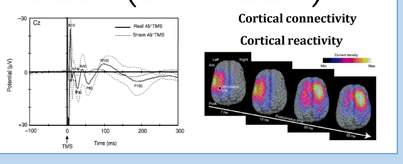


LTP (rTMS)

Cortical plasticity



TEPs (TMS-EEG)



RESULTS

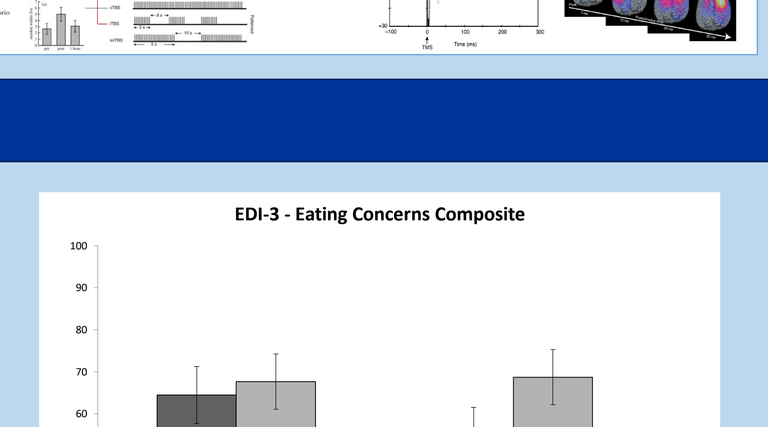
PILOT 24 participants	Active 11F	Sham 13F
Age	14.6 ± 2	15.1 ± 1.5
QI	116.4 ± 8.9	117.1 ± 10.6
BMI	15.4 ± 1.1	15.4 ± 0.9

Significant improvement after active tDCS treatment in the Eating Concerns Composite Score --> tendency toward normalization.

	ACTIVE		SHAM		ACTIVE		SHAM	
	T0 M	SD	T0 M	SD	T1 M	SD	T1 M	SD
BMI	15.4	1.1	15.4	0.9	16.5	1.4	17.1	1.4
EDI-3_Eating Concerns Composite°	64.45	22.60	67.62	23.73	50.00**	38.16	68.69	23.61
EDI-3_Ineffectiveness Composite°	62.36	23.04	68.38	23.53	54.36	35.45	66.54	30.00
EDI-3_Interpersonal Problems Composite°	56.36	32.13	67.06	34.85	48.62	34.75	55.52	39.47
EDI-3_Affective Problems Composite°	57.82	29.58	58.69	30.72	47.09	37.12	55.38	33.27
EDI-3_Overcontrol Composite°	54.64	31.55	60.00	39.52	53.64	36.46	61.23	41.20
EDI-3_Global Psychological Maladjustment°	60.36	28.11	70.69	21.14	53.64	35.57	65.31	27.73
EDE-Q6_Global	1.73	1.47	1.74	1.72	0.63	0.52	1.10	0.88
FOOD ADDICTION LEVEL_YFAS	1.50	0.76	1.20	1.03	23.09	23.01	28.31	23.91
EAT-26	30.00	18.65	37.54	22.38	1.95	1.74	2.53	1.26
BUT	2.03	1.45	2.70	1.20	57.73	18.12	51.00	19.21
MASC2^	59.91	15.64	57.77	13.25	55.27	14.82	56.15	15.08
CDI2^	57.82	12.70	57.23	14.53	63.27	12.03	61.54	10.18
CBCL_Internalizing^	63.27	13.41	63.08	10.41	51.00	6.31	48.54	7.58
CBCL_Externalizing^	53.55	6.76	51.46	6.97	56.45	9.57	54.62	8.70
CBCL_Total^	57.00	10.00	56.62	8.96	50.00	38.16	68.69	23.61

° percentile;^ T score;** significant differences to T0, $p < 0.05$.

Neurophysiological baseline assessment: no significant evidence of resting hemispheric imbalance.



DISCUSSION

Very early results on the tDCS treatment in a subgroup of participants revealed a positive effect on the psychological outcome, albeit difference in BMI improvement were not evident. The clinical trial is ongoing and findings deserve to be confirmed in a larger sample size. Analyses on physiological and neurophysiological measures are in progress.

REFERENCES

[1]Costanzo et al. (2018) *Front Behav Neurosci*.; [2] Murray et al. (2020), *Eat Disord*.; [3] Su et al. (2021) *Hum Brain Map.*

CONTACTS

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