

Specific effect of high frequency tRNS over parietal cortex combined with cognitive training on numerical cognition in children and adolescents with dyscalculia

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Introduction

- Established therapeutic options are still scarce for youths with developmental dyscalculia (DD), with little evidence of efficacy [1].
- Transcranial random noise stimulation (tRNS) has been proposed for improving numerical cognition in typically developed adults [2] and children with DD [1,3].

Participants

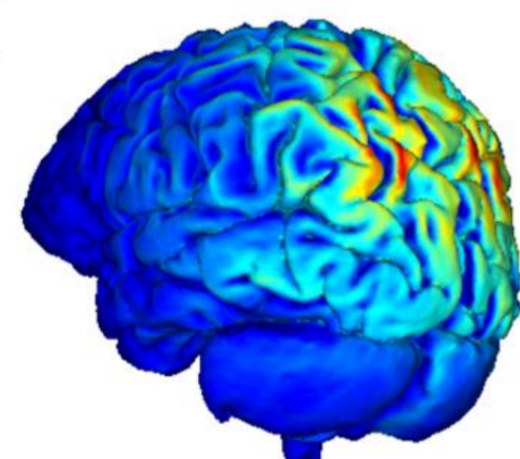
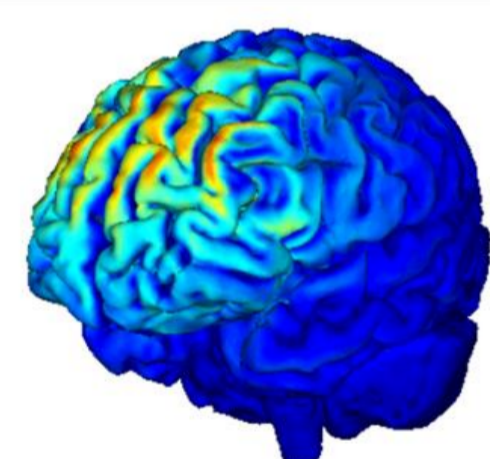
- 23 children and adolescents with DD

3 groups:

1) Frontal Group
tRNS over dIPFC +
cognitive training

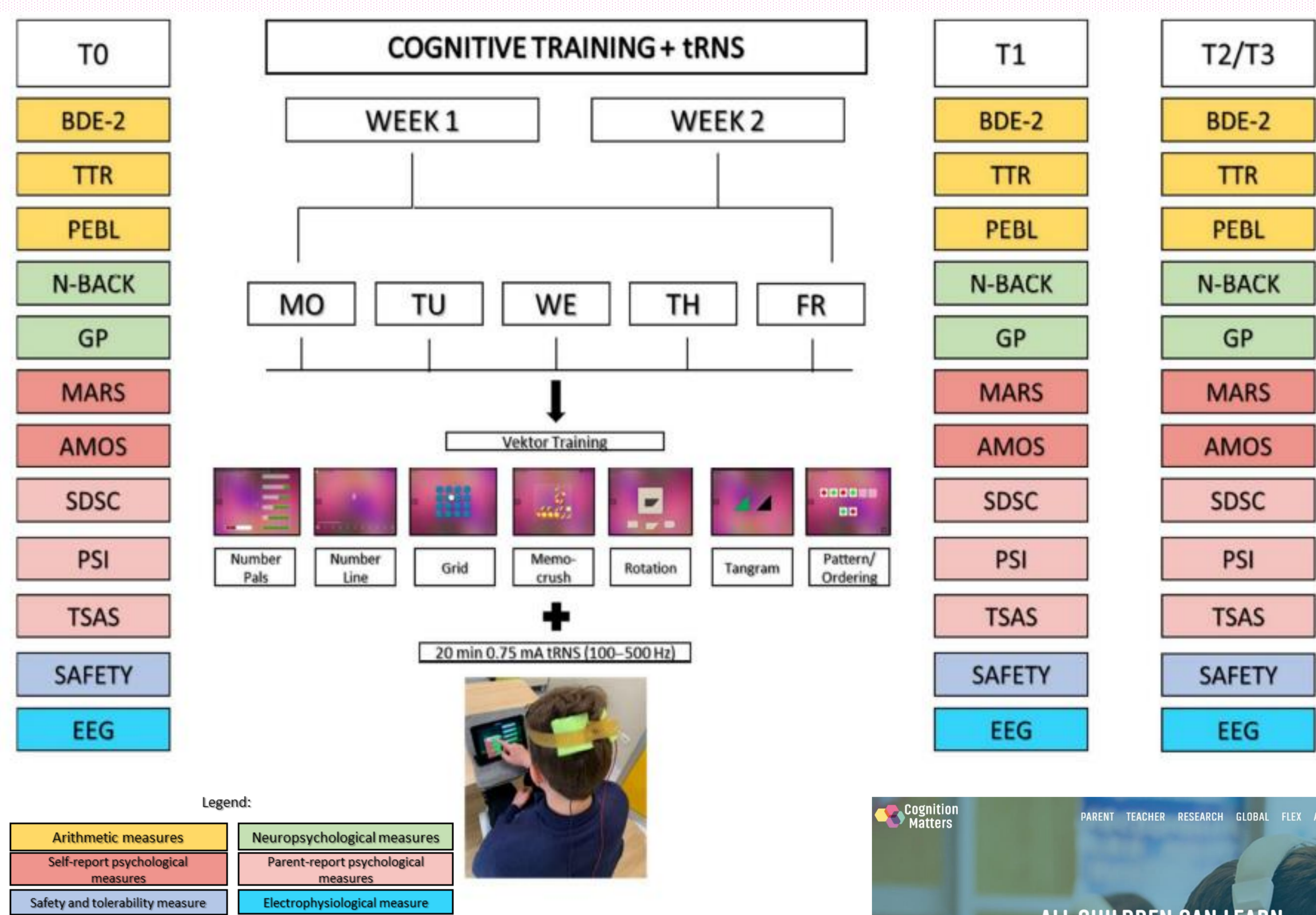
2) Parietal Group
tRNS over PPC +
cognitive training

3) Sham Group
sham tRNS
over dIPFC or PPC +
cognitive training



- Matched for age ($p = 0.92$), nonverbal IQ ($p = 0.41$) and mathematical scores ($p > 0.10$)

Methods and Instruments



Results

1. Clinical Effects of tRNS + Cognitive Training

(Mathematical Total Quotient of BDE-2)

Conditions	% T1 m (ES)			% T2 m (ES)			% T3 m (ES)		
	Nq	Cq	NSq	Nq	Cq	NSq	Nq	Cq	NSq
Frontal Group (N = 7)	14.6 (7.7)	10.1 (7.1)	26 (8.1)	0 (11.2)	0.8 (4.4)	3.4 (5.7)	6.6 (11.2)	-1.53 (11.3)	18.6 (11.6)
Parietal Group (N = 7)	11.3 (7.7)	23.5 (7.1)	6.7 (8.1)	5.6 (11.2)	24.9* (4.4)	20.3** (5.7)	41.1 (11.2)	52.6 (11.3)	45.9 (11.6)
Sham Group (N = 9)	3.8 (6.8)	16.7 (6.2)	10.9 (7.1)	-11.5 (9.9)	6.9 (3.8)	5 (5.1)	27.1 (9.9)	25.4 (9.9)	30.8 (10.2)

Legend: m = mean; SE = Standard Error; %T1 = percentage of improvement immediately after the end of the treatment calculated as $(T1-T0)/T0*100$; %T2 = percentage of improvement 1-week later calculated as $(T2-T0)/T0*100$; %T3 = percentage of improvement 3-month later calculated as $(T1-T0)/T0*100$; Nq = number quotient; Cq = Calculation quotient; NSq = Number Sense quotient.
* $p < 0.05$; ** $p < 0.01$ compared to Frontal Group.

2. Negative correlation between math anxiety and the percentage of improvement at T2 in NSq in the Parietal Group

