Poster number: 248

Transcranial Pulse Stimulation (TPS) – suitable add-on treatment of patients with psychiatric disorders?

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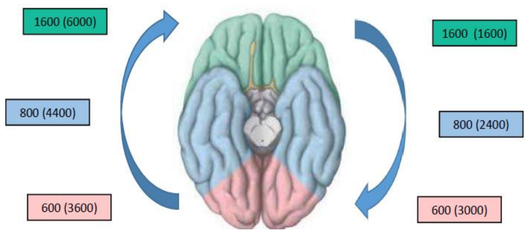
Introduction



Methods of neurostimulation are used to treat neurological and neuropsychiatric disorders. Several noninvasive brain stimulation methods have been investigated, including Transcranial Magnetic Stimulation (TMS), Transcranial Electric Stimulation (tES), Electroconvulsive Therapy (ECT) and Transcranial Pulse Stimualtion (TPS) [1].

While TMS, tES and ECT have been studied extensively, particularly in relation to Alzheimer's Disease (AD) there is an urgent need for more research on TPS. TPS is a low-energy shockwave treatment that has been approved for use in cases of mild to moderate AD. During TPS, sound pulses are introduced into certain brain areas to improve blood flow and the generation of new blood vessels, with the aim of maintaining or even increasing cognitive performance.

In the context of AD, some studies have indicated positive effects when TPS was used. These outcomes are seen in significant improvements in neuropsychological test scores [2, 3, 4, 5] and depressive symptom load [4, 5]. However, this method has yet to be incorporated into clinical practice due to the inability to conclusively assess its effectiveness, which is influenced by several factors.



Our study examines the cognitive performance and depressive symptom load of patients with a mild or moderate AD over the course of TPS treatment. The study aims to investigate whether cognitive performance increases significantly and depressive symptom severity reduces significantly.

Method & Selection

Cognitive performance (MoCA) and depressive symptom severity (GDS) were assessed in female and male patients with an early- or late-onset, mild or moderate AD at baseline (t1), three months (t2, 1st interval) and six months (t3, 2nd interval) following treatment with TPS.

In context of this longitudinal study, which is designed with a single center, the participants were recruited from the outpatient setting Diagnostic|Neurostimulation of a specialized psychiatric clinic in Lower Saxony (Wahrendorff Clinic), Germany.

Data from the clinical sample were analysed using Repeated Measures ANOVA .

Table 1. Sample Characteristic

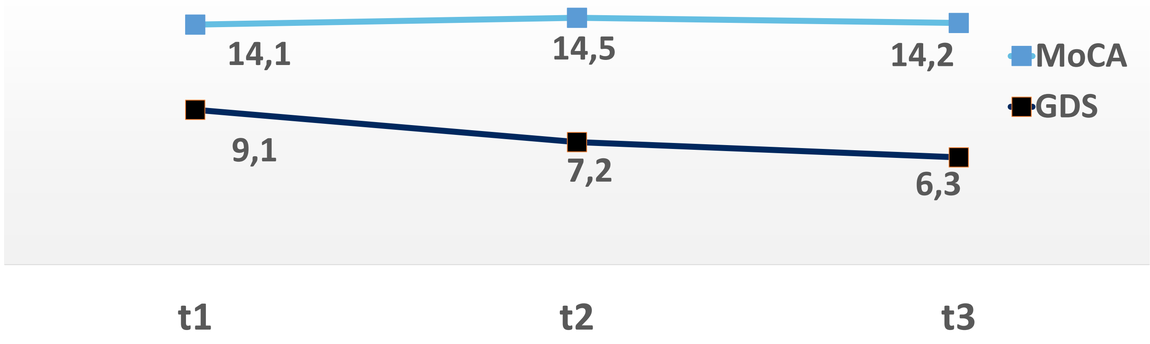
Feature	Women & Men N = 74 (100 %)	Women N = 41 (55 %)	Men N = 33 (45 %)	p
Age *M (SD)*	72 (9.7) min = 48 max = 87	72 (10.2) min = 48 max = 83	71 (9.1) min = 53 max = 87	*n.s.*[a]
Diagnosis (AD, ICD-10) F00.0: Typ 2 (early onset)	19 (26 %)	10 (24 %)	9 (27 %)	*n.s.*[b]
Diagnosis (AD, ICD-10) F00.1: Typ 1 (late onset)	37 (50 %)	23 (56 %)	14 (43 %)	
Diagnosis (AD, ICD-10) F00.2: atypical / mixed	16 (21 %)	7 (17 %)	9 (27 %)	
Diagnosis (AD, ICD-10) F00.9: not specified	2 (3 %)	1 (3 %)	1 (3 %)	

Notes:

M = Mean Value, *SD* = Standard Deviation, [a] *t*-test, [b] χ^2-test, *n.s.* = not significant

Results

Figure 1. **Repeated Measures ANOVA – Overall Time Effects due to TPS**



MoCA: no statistically significant effect of time

- $F(2, 84) = .359$, $p = .700$, $n = 43$ (Mauchly-Test of Sphericity)
- Bonferroni-adjusted post-hoc analysis revealed no statistically significant differences in cognitive performance at t1 | t2, t1 | t3, t2 | t3 (n.s.)

GDS: statistically significant effect of time

- $F(2, 44) = 5.339$, $p \leq .01^{**}$, $n = 23$ (Mauchly-Test of Sphericity)
- Bonferroni-adjusted post-hoc analysis revealed statistically significant reduction in depressive symptom severity at t3 compared to t1 ($p \leq .05^{*}$)

Notes:

Cutoffs MoCA: ≤ 9 = severe, 10 – 17 = moderate, 18 – 25 = mild, ≥ 26 = minor cognitive impairments

Cutoffs GDS: ≤ 9 = minor, 10 – 19 = moderate, 20 – 30 = severe depressive symptom severity

Conclusion

As in other studies, effects were observed in patients with mild to moderate AD [2, 3, 4, 5]. The results suggest that cognitive performance can be stabilised and the depressive symptom severity can be reduced (see Figure 1). However, it is important to note that the results are based on a relatively small sample size and lack control conditions, which may limit the generalisability of the findings.

Furthermore, the results should be considered in light of the fact that cognitive performance and depressive symptoms can also be influenced by other factors. The study is ongoing, so these are preliminary results.

Further research is required to evaluate the effectiveness of TPS treatment for AD and to assess the potential suitability of this neurostimulation method as an add-on therapy to complement previous drug and non-drug approaches. Further research is also required into the use of TPS in depression and other psychiatric disorders, given the lack of scientifically reliable findings on this topic.

References:

[1] Faßbender R.V., Goedecke J., Visser-Vandewalle V., Fink G.R., Onur O.A. (2022). Stimulationsverfahren zur Behandlung von Demenzen. *Fortschr Neurol Psychiat 90*:336-342.

[2] Beisteiner R., Matt E., Fan C., Baldysiak H., Schönfeld M., Philippi Novak T., Amini et al. (2019). Transcranial Pulse Stimulation with Ultrasound in Alzheimer's Disease – A New Navigated Focal Brain Therapy. *Adv Sci (Weinh) 7(3):*1902583.

[3] Popescu T., Pernet C., Beisteiner R. (2021). Transcranial ultrasound pulse stimulation reduces cortical atrophy in Alzheimer's patients: A follow-up study. *Alzheimers Dement (NY) 7(1)*:e12121.

[4] Cont C., Stute N., Galli A., Schulte C., Logmin K., Trenado C., Wojtecki L. (2022). Retrospective real-world pilot data on TPS in mild to severe Alzheimer's patients. *Front Neurol 13:*01–09.

[5] Matt E., Dörl G., Beisteiner R. (2022) Transcranial pulse stimulation (TPS) improves depression in AD patients on state-of-the-art treatment. *Alzheimers Dement (NY) 8(1)*:e12245.

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