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# Supplementary Material

**Article Title:** Behavioral Effects of Neurofeedback Compared to Stimulants and Physical Activity in Attention-Deficit/Hyperactivity Disorder: A Randomized Controlled Trial

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## Disclaimer

This Supplementary Material has been provided by the author(s) as an enhancement to the published article. It has been approved by peer review; however, it has undergone neither editing nor formatting by in-house editorial staff. The material is presented in the manner supplied by the author.

# eAppendix 1: CONSORT 2010 checklist of information to include when reporting a randomised trial*

| Section/Topic | Item No | Checklist item | Reported on page No |
|---|---|---|---|
| **Title and abstract** | | | |
| | 1a | Identification as a randomised trial in the title | 1 |
| | 1b | Structured summary of trial design, methods, results, and conclusions (for specific guidance see CONSORT for abstracts) | 1 |
| **Introduction** | | | |
| Background and objectives | 2a | Scientific background and explanation of rationale | 1 |
| | 2b | Specific objectives or hypotheses | 2 |
| **Methods** | | | |
| Trial design | 3a | Description of trial design (such as parallel, factorial) including allocation ratio | 2 |
| | 3b | Important changes to methods after trial commencement (such as eligibility criteria), with reasons | n/a |
| Participants | 4a | Eligibility criteria for participants | 2 |
| | 4b | Settings and locations where the data were collected | 2 |
| Interventions | 5 | The interventions for each group with sufficient details to allow replication, including how and when they were actually administered | 2-4 |
| Outcomes | 6a | Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed | 4 |
| | 6b | Any changes to trial outcomes after the trial commenced, with reasons | n/a |
| Sample size | 7a | How sample size was determined | 2 |
| | 7b | When applicable, explanation of any interim analyses and stopping guidelines | n/a |
| Randomisation: | | | |
| Sequence generation | 8a | Method used to generate the random allocation sequence | 2 |
| | 8b | Type of randomisation; details of any restriction (such as blocking and block size) | n/a |
| Allocation concealment mechanism | 9 | Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned | 2 |
| Implementation | 10 | Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions | 2 |
| Blinding | 11a | If done, who was blinded after assignment to interventions (for example, participants, care providers, those | n/a |

| | | | |
|---|---|---|---|
| | | assessing outcomes) and how | |
| | 11b | If relevant, description of the similarity of interventions | 2 |
| Statistical methods | 12a | Statistical methods used to compare groups for primary and secondary outcomes | 4 |
| | 12b | Methods for additional analyses, such as subgroup analyses and adjusted analyses | 4 |
| **Results** | | | |
| Participant flow (a diagram is strongly recommended) | 13a | For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome | 3 |
| | 13b | For each group, losses and exclusions after randomisation, together with reasons | 3 |
| Recruitment | 14a | Dates defining the periods of recruitment and follow-up | 1 & 2 &4 |
| | 14b | Why the trial ended or was stopped | n/a |
| Baseline data | 15 | A table showing baseline demographic and clinical characteristics for each group | 5 |
| Numbers analysed | 16 | For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups | 3 & 4-6 |
| Outcomes and estimation | 17a | For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval) | 5 |
| | 17b | For binary outcomes, presentation of both absolute and relative effect sizes is recommended | n/a |
| Ancillary analyses | 18 | Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory | 4-6 |
| Harms | 19 | All important harms or unintended effects in each group (for specific guidance see CONSORT for harms) | 6 |
| **Discussion** | | | |
| Limitations | 20 | Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses | 6-7 |
| Generalisability | 21 | Generalisability (external validity, applicability) of the trial findings | 6-7 |
| Interpretation | 22 | Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence | 6-7 |
| **Other information** | | | |
| Registration | 23 | Registration number and name of trial registry | 1 & 2 |
| Protocol | 24 | Where the full trial protocol can be accessed, if available | n/a |
| Funding | 25 | Sources of funding and other support (such as supply of drugs), role of funders | 7 |

*We strongly recommend reading this statement in conjunction with the CONSORT 2010 Explanation and Elaboration for important clarifications on all the items. If relevant, we also recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials. Additional extensions are forthcoming: for those and for up to date references relevant to this checklist, see www.consort-statement.org.

eAppendix 2

## Methods

*Interventions*

*Neurofeedback.* The THERAPRAX® EEG Biofeedback system (Neuroconn GmbH, Germany) with a DC-amplifier and a sampling rate of 128Hz was used to transmit and analyze the EEG signal. Reference and ground electrodes were attached to right and left mastoids, respectively. Electro-oculogram was obtained with two electrodes at external canthi, and two electrodes at supra- and infraorbital sides. Ocular correction was applied as described in Schlegelmilch et al.(2004). Subsequently, a theta/beta index [theta(μV/Hz)-beta(μV/Hz)/theta(μV/Hz)+beta(μV/Hz) was computed with a short-time-fourier transformed moving average for direct feedback.

Each training session started with a 1-minute baseline theta/beta index measurement, followed by 10 runs of neurofeedback.. Each run comprised four 30-second epochs. The first run of the first training started on a training level with the aim to reduce the theta/beta index with 3%. The training level increased or decreased based on performance of former runs and could range between 3-52%, relative to training session baseline, over the total treatment period of 10 weeks. Number of credits per trial depended on the training level, with more credits for higher levels.

**Supplementary eTable 1.** Complete case analyses of outcome measures and side effects

| Questionnaire | | | Pre-Intervention | Post-Intervention | Adjusted difference [95% *CI*] at post-intervention t1-t0 | Time (T0 to T1) | | | | NFB, PA and MPH over time | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *n* | *M(SD)* | *M(SD)* | | *df* | *F* | $\eta_p^2$ | *p* | *df* | *F* | $\eta_p^2$ | *p* |
| **Parent ratings** | | | | | | | | | | | | | |
| SDQ | | | | | | (1,100) | 30.70 | 0.24 | .001 | (2,100) | 1.44 | 0.03 | .24 |
| | NFB | 38 | 16.76(4.52) | 14.74(5.95) | -2.03[-3.40, -0.65] | | | | | | | | |
| | MPH | 31 | 16.03(4.15) | 12.81(5.33) | -3.23[-4.76, -1.69] | | | | | | | | |
| | PA | 34 | 17.50(3.69) | 15.97(4.55) | -1.53[-2.93, -0.13] | | | | | | | | |
| SWAN Inattention | | | | | | (1,100) | 51.93 | 0.34 | <.001 | (2,100) | 10.54 | 0.17 | <.001 |
| | NFB | 38 | 1.44(0.51) | 1.12(0.67) | -0.33[-0.54, -0.11] | | | | | | | | |
| | MPH | 31 | 1.40(0.73) | 0.50(0.82) | -0.90[-1.17, -0.64] | | | | | | | | |
| | PA | 34 | 1.33(0.68) | 1.14(0.71) | -0.19[-0.40, 0.23] | | | | | | | | |
| H/I | | | | | | (1,100) | 32.84 | 0.25 | <.001 | (2,100) | 3.00 | 0.06 | .06 |
| | NFB | 38 | 1.30(0.71) | 1.01(0.82) | -0.29[-0.52, -0.07] | | | | | | | | |
| | MPH | 31 | 1.10(0.67) | 0.49(0.82) | -0.61[-0.85, -0.36] | | | | | | | | |
| | PA | 34 | 1.21(0.82) | 0.98(0.77) | -0.23[-0.45, -0.01] | | | | | | | | |
| **Teacher ratings** | | | | | | | | | | | | | |
| SDQ | | | | | | (1,93) | 3.46 | 0.04 | .066 | (2,93) | 8.03 | 0.16 | .001 |
| | NFB | 37 | 14.22(4.65) | 15.14(5.15) | 0.92[-0.49, 2.33] | | | | | | | | |
| | MPH | 30 | 13.73(5.28) | 10.23(6.35) | -3.50[-5.31, -1.70] | | | | | | | | |
| | PA | 29 | 15.86(5.46) | 15.93(5.12) | 0.07[-1.48, 1.62] | | | | | | | | |
| SWAN Inattention | | | | | | (1,93) | 36.09 | 0.28 | <.001 | (2,93) | 21.79 | 0.32 | <.001 |
| | NFB | 37 | 1.37(0.91) | 1.26(0.76) | -0.11[-0.33, 0.11] | | | | | | | | |
| | MPH | 30 | 1.53(0.60) | 0.49(0.75) | -1.05[-1.33, -0.77] | | | | | | | | |
| | PA | 29 | 1.31(0.70) | 1.25(0.72) | -0.07[-0.28, 0.15] | | | | | | | | |
| H/I | | | | | | (1,93) | 10.56 | 0.10 | .002 | (2,93) | 8.38 | 0.15 | <.001 |
| | NFB | 37 | 1.15(0.92) | 1.12(1.13) | -0.03[-0.30, 0.25] | | | | | | | | |
| | MPH | 30 | 0.94(1.30) | 0.18(0.92) | -0.76[-1.15, -0.38] | | | | | | | | |
| | PA | 29 | 1.16(0.88) | 1.14(0.91) | -0.03[-0.22, 0.16] | | | | | | | | |
| **Side effects** | | | | | | | | | | | | | |
| SDSC | | | | | | (1,96) | 3.24 | 0.03 | .075 | (2,93) | 0.39 | 0.01 | .68 |
| | NFB | 38 | 45.32(10.55) | 43.16(9.45) | -2.16[-4.82, 0.51] | | | | | | | | |
| | MPH | 29 | 45.41(9.22) | 44.76(9.61) | -0.66[-3.52, 2.21] | | | | | | | | |
| | PA | 32 | 46.72(13.00) | 45.59(11.22) | -1.13[-3.14, 0.89] | | | | | | | | |

Note. H/I=Hyperactivity/Impulsivity scale, M=Mean, SD=Standard Deviation, SDSC=Sleep Disturbance Scale for Children, SDQ=Strength and Difficulty Questionnaire, SWAN=Strengths and Weaknesses in ADHD and Normal Behaviors