**Supplementary Material**

**Overview of intervention:**

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**Inclusion criteria**

Inclusion criteria were assessed by a three stage procedure: initial telephone screening of interested individuals was followed by a standardized in-person assessment of diagnostic criteria by trained psychologists using the *International Personality Disorder Examination* (IPDE). If eligible, individuals were placed on a waiting list until a therapy group of three to six patients could start. Three weeks prior to therapy start the OAS-M interview decided over final inclusion into the study.

**Exclusion criteria:** Additional non-study psychotherapy, pregnancy, epilepsy, bipolar I disorder or schizophrenia, current substance abuse or addiction as well as change in medication within the last three weeks before allocation to trial. In the course of the study we resigned from current cannabis abuse as an exclusion criterion.

**Diagnosticians:** Diagnostic assessment training in the M-OAS interview subsumed a lecture, working through a written manual, and a training package and scoring videotaped M-OAS interviews (Endicott et al. 2002).

Endicott, J., et al., *A novel approach to assess inter-rater reliability in the use of the Overt Aggression Scale-Modified.* Psychiatry Res, 2002. **112**(2): p. 153-9.

**Therapists:** Psychiatrists and clinical psychologists all in completed or advanced psychotherapy training (professional experience in months: MAAP: M=58.0, SD=18.6, min=44, N=5; NSSP: M=60.5, SD=36.2, min=48, N=4) conducted the treatments. Therapists were randomly assigned to either MAAP or NSSP and each conducted only one type of treatment. Therapists of both conditions finished a one-day (8 h) training course which was realized by experienced psychotherapists with special qualification in the methods of MAAP (B.M.) and NSSP (B.J.), respectively. All therapists ran through a therapy program for exercise before conducting therapies included in the study. All treatment sessions were videotaped. Therapists received three video-based supervisions after group session 3 or 4, 6 or 7, and 9 or 10, and two videos from the early and late therapy phase of each group were checked for adherence to the treatment procedures and competency on a random basis using specific rating scales [[33](#_ENREF_33)]. All sessions but one met criteria for fidelity (>4 on a 6-point rating scale) with on average 5.24 (SD 0.42) for manual adherence and 5.51 (SD 0.37) for competency in the MAAP group and 5.66 (SD 0.31) for manual adherence and 5.48 (SD 0.66) for competency in the NSSP group.

**Homework in form of app-based attentional training:** In task 1 we presented six runs with 9 pictures each. Each picture was presented for 10 sec. On each picture a gathering of people was shown with exactly one individual exhibiting a friendly facial expression while the others looked neutral or frowning (see Fig. 2a in the supplement). In task 2 we again presented six runs with 9 pictures each. Each picture could be seen as long as needed. Each picture consisted of two smiling hidden faces and two threatening (angry or anxious) hidden faces. The participants were instructed to find the smiling faces (see Fig. 2b in the supplement). In both tasks the participants received feedback to their performance based on accuracy (false choices and omissions) in order to increase motivation. After half of the treatment program all six runs were once repeated indicating improvement (or deterioration) in performance.

Fig. 2a: App-based attentional training, Task 1

Fig. 2a: App-based attentional training, Task 2

**Further details of statistics:** Since overt aggression values were skewed in our sample, they were log transformed for analysis (after adding a constant of 1 to all values to avoid problems with aggression scores of 0), which resulted in approximately normally distributed, homoscedastic residuals. Effect sizes (differences in adjusted means between treatment arms) are given on the original scale for ease of interpretation. Continuous secondary endpoints were analyzed with an analogous mixed model, response rates were compared by logistic regression, again adjusted for baseline overt aggression score. Intracluster correlation coefficients (ICC) were calculated as the between-cluster variance (of therapy groups) divided by the sum of the between-cluster and within-cluster variances from the mixed linear model.

**Statistics:** To describe differences in BPD severity between treatment groups which were present at the time of inclusion despite randomisation, we report Cohen’s d (difference in mean divided by pooled standard deviation) for those clinical characteristics which showed the largest relative difference (as judged by Welch’s t-test or Fisher’s exact test using a significance level of 0.05).

Data were analysed using *IBM SPSS Statistics* (version 25) for Windows.

Clarifications to the primary outcome

In the German Registry for Clinical Trials, DRKS00009445, we indicated the OAS-M as primary outcome to measure changes in aggressive behaviors without naming the subscales we were interested in. The OAS-M measures aggression against others (Q1-3), aggression against oneself (Q4), irritability (Q5-6), and suicidal tendencies (items 7 to 7b). Since we were specifically interested in overt aggression against others, and not against oneself (that has been the focus of several previous trials), we chose the sum score of Items 1, 2, 3 as our primary outcome. For clarification, the following table in addition to table 2 in the text (which presents the data for items 1-3) presents the means and standard deviations for the OAS-M total score as well as for the other items, that is item 4 (self-injury), items 5 and 6 for irritability and items 7 and 7b for suicidal tendencies.

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|  | **pre-treatment** | | | | | | **post-treatment** | | | | | | **follow-up** | | | | | |
| **Outcomes** | **MAAP (n = 25)** | | | **NSSP (n = 24)** | | | **MAAP (n = 25)** | | | **NSSP (n = 24)** | | | **MAAP (n = 25)** | | | **NSSP (n = 20)** | | |
| M-OAS mITT set | M (SD) | Min | Max | M (SD) | Min | Max | M (SD) | Min | Max | M (SD) | Min | Max | M (SD) | Min | Max | M (SD) | Min | Max |
| total (item 1 to item 7b) | 58.72 (45.56) | 3 | 142 | 30.17 (21.61) | 3 | 76 | 26.67 (25.44) | 2 | 120 | 26.88 (21.67) | 3 | 80 | 28.64 (46.97) | 1 | 238 | 37.05 (36.93) | 5 | 169 |
| self-injury (item 4) | 12.48 (23.57) | 0 | 84 | 4.75 (11.26) | 0 | 42 | 6.50 (12.34) | 0 | 54 | 7.88 (14.26) | 0 | 39 | 12.60 (41.94) | 0 | 210 | 6.75 (12.00) | 0 | 48 |
| irritability (item 5 to item 6) | 6.48 (1.30) | 3 | 8 | 5.42 (1.44) | 3 | 8 | 4.58 (1.44) | 2 | 8 | 4.79 (1.72) | 1 | 9 | 4.44 (1.50) | 1 | 8 | 5.75 (1.71) | 3 | 9 |
| suicidal tendency (item 7 to item 7b) | 1.16 (1.21) | 0 | 3 | 0.83 (1.05) | 0 | 3 | 0.92 (1.02) | 0 | 3 | 1.38 (1.81) | 0 | 8 | 1.00 (0.96) | 0 | 3 | 1.60 (1.60) | 0 | 7 |