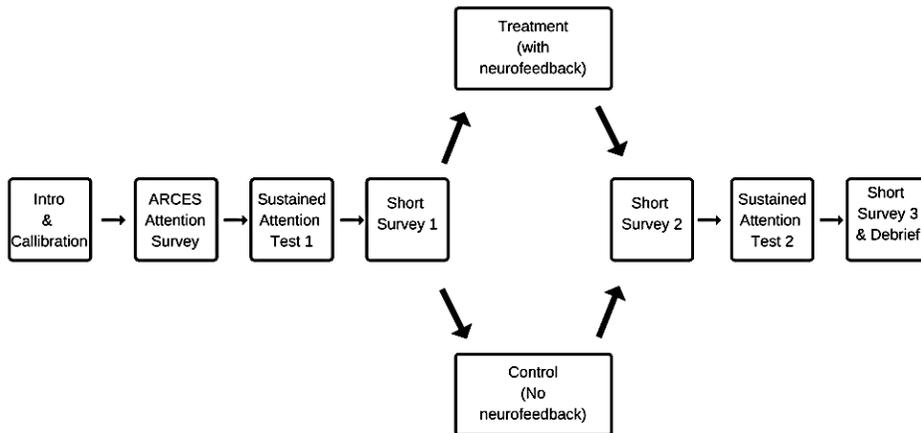


Study Design and Analysis Plan

Independent Variables

1. **Between factor** -- group: intervention and control where intervention group uses Mind-Full intervention with neurofeedback ON, and control group uses Mind-Full intervention with neurofeedback OFF (Control/off condition is "sham" – they don't know neurofeedback is off – done to control for expectations of benefit).
2. **Within factor** – test/survey administration time points: 1) Pre-test (this provides a baseline at the beginning of session), 2) Post-test (right after Mind-Full intervention), 3) Post-SART (after final selective attn. test)

Procedure: Data Collection (test administration time points for all Dependent Variables)



Dependent Variables (collected for both groups: intervention & control)

1. ARCES = test score in an attention survey used to screen participants and remove those with severe ADHD.
2. Errors of omission = Count of errors of omission in a sustained attention test, administered at pre-test as baseline and post-intervention
3. Errors of commission = Count of errors of commission in a sustained attention test, administered at pre-test as baseline and post-intervention
4. Average attention brainwave index = Index (scale is 0-100, where >40 indicates attentive state), averaged for each minute of ten minute intervention during intervention
5. Attention survey = score (1-10 scale, where 10 is high) on a self-report question about attention, administered at pre-test as baseline, post intervention and post-SART test.

Detailed Hypotheses

H1: Participants in the intervention group (neurofeedback ON) will make fewer errors of omission in a test of sustained attention (SART) after the Mind-Full intervention than participants in the control group (neurofeedback OFF).

H2: Participants in the intervention group (neurofeedback ON) will make fewer errors of commission in a test of sustained attention (SART) after the Mind-Full session than participants in the control group (neurofeedback OFF).

H3: Participants in the intervention group (neurofeedback ON) will have higher average attention brainwave indices during each minute of the Mind-Full intervention than the control group (neurofeedback OFF).

H4: Participants in the intervention group (neurofeedback ON) will self-report higher attention survey scores after the Mind-Full intervention and after the final SART test than participants in the control group (neurofeedback OFF).

Data Processing and Analysis

Data Processing: Clean-up and Formatting

The data files have already been cleaned up and formatted.

1. Participant 27 was removed from all data files because s/he self-reported extreme attentional challenges identified in the ARCES test. There is no participant data for P5, P15 and P17 so they are not included in data.
2. SART: Superfluous data was removed.
3. Attention brainwave index: for each participant the index was averaged per minute and superfluous data was removed.

The brainwave data is collected at 512 Hz (512 x per second). The one minute sampling protocol was chosen because if you run an ANOVA using all the data points, it showed huge significance because of the large n. However, this is deceptive. So you need to reduce the number of data points by breaking it up into smaller sections. One minute was selected because it seemed like a logical breakpoint for the data and it would tell us if, in any given minute, either group was more attentive. However, you should consider this sampling strategy in your discussion. If you were to do it again, would you choose smaller intervals or larger or event-based intervals, and why?

4. Data files were formatted. SPSS used wide excel format and JMP uses a stacked format.

This analysis below instructions and syntax samples are for SPSS. It is possible to do the descriptives and plots in JMP, and only use SPSS for mixed ANOVAs. Both data sets have been provided in Excel.

5. Install statistics package(s) you will use. Import the data files into the statistics package(s) you will use.

Descriptive and Inferential Analysis

H1: Hypothesis 1 – errors of omission

Descriptive Statistics

Using SPSS, run descriptive statistics (e.g. mean, standard error) and histograms (plots) for the dependent variable ‘errors of omission’ in the sustained attention test (SART) with a within-factor independent variable of the SART administration point (pre, post) and a between-subjects factors of group (neurofeedback on, off).

Your syntax saved at the top of the SPSS output file should look something like this:

```
EXAMINE VARIABLES=PreOmissionNumber PostOmissionNumber BY Treatment
/PLOT BOXPLOT HISTOGRAM NPLOT
/COMPARE GROUPS
/STATISTICS DESCRIPTIVES
/CINTERVAL 95
/MISSING LISTWISE
/NOTOTAL.
```

Inferential Statistics

Using SPSS, run a mixed design 2x2 ANOVA for the dependent variable ‘error of omission’ with a within-subjects factor of the SART administration time point (pre, post), and a between-subjects factor of group (neurofeedback on, off).

Your syntax saved at the top of the SPSS output file should look something like this:

```
GLM PreOmissionNumber PostOmissionNumber BY Treatment
/WSFACTOR=time 2 Polynomial
/METHOD=SSTYPE(3)
/SAVE=SRESID
/PLOT=PROFILE(time*Treatment)
/EMMEANS=TABLES(Treatment) COMPARE ADJ(BONFERRONI)
/EMMEANS=TABLES(time) COMPARE ADJ(BONFERRONI)
/EMMEANS=TABLES(Treatment*time)
/PRINT=DESCRIPTIVE ETASQ
/CRITERIA=ALPHA(.05)
/WSDESIGN=time
/DESIGN=Treatment.
```

H2: Hypothesis 2 – errors of commission

Descriptive Statistics

Using SPSS, run descriptive statistics (e.g. mean, standard error) and histograms (plots) for the dependent variable ‘errors of commission’ in the sustained attention test (SART) with a within-factor independent variable of the SART administration point (pre, post) and a between-subjects factors of group (neurofeedback on, off).

Your syntax saved at the top of the SPSS output file should look similar to H1.

Inferential Statistics

Using SPSS, run a mixed design 2x2 ANOVA for the dependent variable ‘error of commission’ with a within-subjects factor of the SART administration time point (pre, post), and a between-subjects factor of group (neurofeedback on, off).

Your syntax saved at the top of the SPSS output file should look similar to H1.

H3: Hypothesis 3 – average attentive brainwave index (sampled for one minute intervals)

Descriptive Statistics

Using SPSS, run descriptive statistics (e.g. mean, standard error) and histograms (plots) for the dependent variable 'average attention brainwave index' sampled every one minute with a within-factor independent variable of the SART administration point (pre, post) and a between-subjects factors of group (neurofeedback on, off).

Your syntax saved at the top of the SPSS output file should look something like this:

```
EXAMINE VARIABLES=Minute1 Minute2 Minute3 Minute4 Minute5 Minute6 Minute7 Minute8 Minute9 Minute10
  BY Treatment
/PLOT BOXPLOT HISTOGRAM NPLOT
/COMPARE GROUPS
/STATISTICS DESCRIPTIVES
/CINTERVAL 95
/MISSING LISTWISE
/NOTOTAL.
```

Inferential Statistics

Using SPSS, run a 2x10 RM ANOVA for the dependent variable 'average attention brainwave index' with the within-subjects factor of each of minute of the ten minutes in the session (1,2,3 ... 10 min) and the between-subjects factor of group (neurofeedback on, off).

Your syntax saved at the top of the SPSS output file should look something like this:

```
GLM Minute1 Minute2 Minute3 Minute4 Minute5 Minute6 Minute7 Minute8 Minute9 Minute10 BY Treatment
/WSFACTOR=Time 10 Polynomial
/METHOD=SSTYPE(3)
/SAVE=SRESID
/PLOT=PROFILE(Treatment*Time)
/EMMEANS=TABLES(Treatment) COMPARE ADJ(BONFERRONI)
/EMMEANS=TABLES(Time) COMPARE ADJ(BONFERRONI)
/EMMEANS=TABLES(Treatment*Time)
/PRINT=DESCRIPTIVE ETASQ
/CRITERIA=ALPHA(.05)
/WSDESIGN=Time
/DESIGN=Treatment.
```

H4: Hypothesis 4 – self-report attention survey scores

Descriptive Statistics

Using SPSS run descriptive statistics (e.g. mean, standard error) and histograms (plots) for the dependent variables " dependent variable 'self-report survey of attention score'" with a within-factor independent variable administration point (1. pre, 2. post-intervention, 3. post-SART) and a between-subjects factors of group (neurofeedback on, off).

Your syntax saved at the top of the SPSS output file should look something like this:

```
EXAMINE VARIABLES=Survey1 Survey2 Survey3 BY Treatment
/PLOT BOXPLOT HISTOGRAM NPLOT
/COMPARE GROUPS
/STATISTICS DESCRIPTIVES
/CINTERVAL 95
/MISSING LISTWISE
/NOTOTAL.
```

Inferential Statistics

Using SPSS a 2x3 ANOVA for the dependent variable 'self-report survey of attention score' with the within-subjects repeated measure factor of the survey assessment points (1. pre-test, 2. post-intervention, 3. post-SART) as repeated measures factors and between-subjects factor of the neurofeedback group (on, off).

Your syntax saved at the top of the SPSS output file should look something like this:

```
GLM Survey1 Survey2 Survey3 BY Treatment
/WSFACTOR=SurveyNumber 3 Polynomial
/METHOD=SSTYPE(3)
/SAVE=SRESID
```

```
/PLOT=PROFILE(SurveyNumber*Treatment)
/EMMEANS=TABLES(Treatment) COMPARE ADJ(BONFERRONI)
/EMMEANS=TABLES(SurveyNumber) COMPARE ADJ(BONFERRONI)
/EMMEANS=TABLES(Treatment*SurveyNumber)
/PRINT=DESCRIPTIVE ETASQ
/CRITERIA=ALPHA(.05)
/WSDESIGN=SurveyNumber
/DESIGN=Treatment
```