

# **Excercise**

Design your own neurofeedback study and use the three resources: a) Prerequisite for a good neurofeedback study, b) CRED-nf Best Practice Checklist, the c) decision Tree. Try to specify the aspects mentioned in them as precisely as possible. To do this, read the descriptions briefly (see the links). Use the small group for questions and discussion. It will not be possible to work on all aspects, so go into the parts you are less familiar with.



## Design your own NF study

### **Examples:**

- Frontal alpha asymmetry NF for the treatment of depressive symptoms, with an active control group
- Attention deficit hyperactivity (ADHD) disorder using a new connectivity NF protocol compared to a standard NF protocol (e.g. theta/beta ratio NF training)
- Upper alpha training for the improvement of cognition in schizophrenia, more than nonspecific effects?
- Frontal-midline theta to improve of executive functions in mild cognitive impairment
  - Reduction of arousal-related alpha activity in patients with post-traumatic stress disorder (PTSD)

## Prerequisites of a good neurofeedback study

#### Construct validity of the feature

 The feature (e.g., the relative power of an oscillation), which is indented to be modulated by neurofeedback, should be selected hypothesis-driven, thus based on current knowledge of cognitive neuroscience and should guide the implementation of the online-feature-extraction, such as the electrode placement for feedback.

### Trainability of the feature

- The modulated feature should show positive learning indices in contrast to untrained features.
- The learning indices should be evaluated regarding their effect strength by calculating effect sizes.

#### Transfer to performance

According to the construct validity, the neurofeedback training is expected to result in behavioral (performance) changes.

#### Usage of an active control group

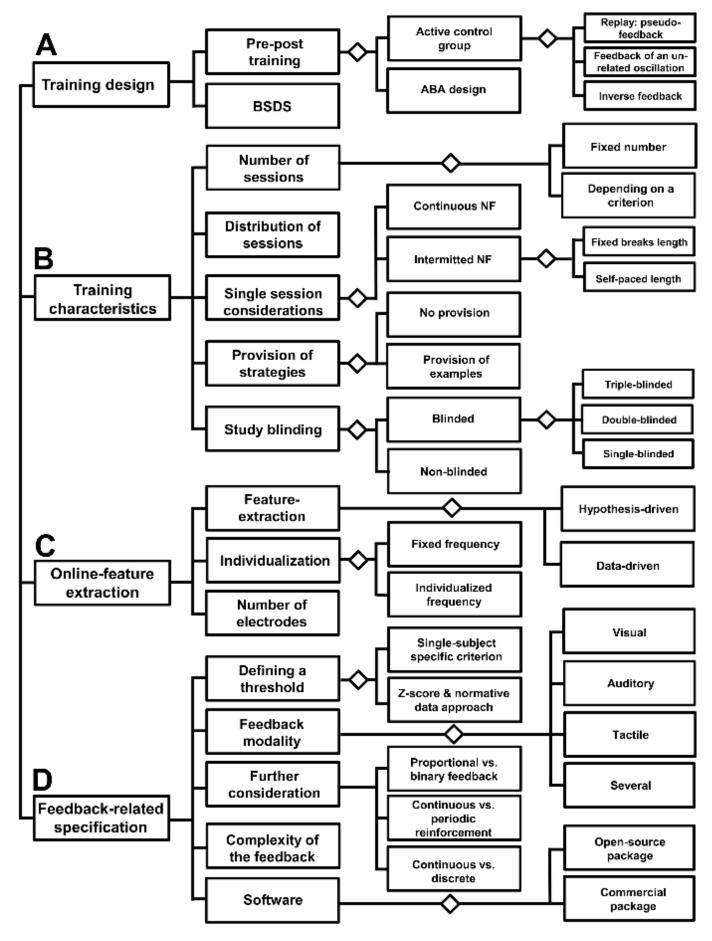
- The usage of a credible sham-/pseudo neurofeedback control group strongly recommended..
- An ABA design can be used alternatively when the implementation of an active control group is not possible.
- The usage of control groups helps to distinguish between true enhancements, repetition-related and non-specific effects. A passive control group controls for repetition-related effects, whereas an active control group controls for repetition-related and unspecific-effects arising for instance from the contact with the training instructor, from regular lab visits, training induced-management etc.

#### Random assignment of participants

- Effects not related to the intervention are prevented such as selection effects, expectancy effects, effects due to
  events between pre-and post measurements (maturation, developmental effects), regression to the mean
- · Alternatively, the usage of a (pseudo) randomized approach can be performed.

Domain	Item #	Checklist item	Reported on page #
Pre-experin	nent		
	1a	Pre-register experimental protocol and planned analyses	
	1b	Justify sample size	
Control gro	ups		
g	2a	Employ control group(s) or control condition(s)	
	2b	When leveraging experimental designs where a double-blind is possible, use a double-blind	
	2c	Blind those who rate the outcomes, and when possible, the statisticians involved	
	2d	Examine to what extent participants and experimenters remain blinded	·
	2e	In clinical efficacy studies, employ a standard-of-care intervention group as a benchmark for improvement	
Control me	asures		
	3a	Collect data on psychosocial factors	
	3b	Report whether participants were provided with a strategy	8
	3c	Report the strategies participants used	
	3d	Report methods used for online-data processing and artefact correction	
	3e	Report condition and group effects for artefacts	· c
Feedback s	pecificatio	ns	
	4a	Report how the online-feature extraction was defined	
	4b	Report and justify the reinforcement schedule	
	4c	Report the feedback modality and content	
	4d	Collect and report all brain activity variable(s) and/or contrasts used for feedback,	
		as displayed to experimental participants	5.0
	4e	Report the hardware and software used	
Outcome m	easures		
Brain	5a	Report neurofeedback regulation success based on the feedback signal	
	5b	Plot within-session and between-session regulation blocks of feedback	
		variable(s), as well as pre-to-post resting baselines or contrasts	
	5c	Statistically compare the experimental condition/group to the control	
		condition(s)/group(s) (not only each group to baseline measures)	
Behaviour	6a	Include measures of clinical or behavioural significance, defined a priori, and	
	CL	describe whether they were reached	
	6b	Run correlational analyses between regulation success and behavioural outcomes	
		Outcomes	
Data storag	<b>je</b> 7a	Upload all materials, analysis scripts, code, and raw data used for analyses, as	
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