



Neurofeedback bij ADHD:
wonderlijk middel of wondermiddel?



Opbouw

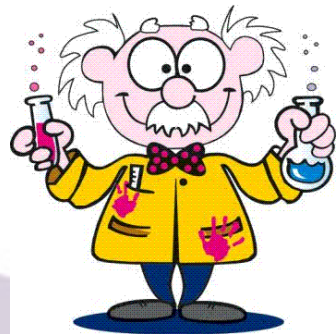
1. Neurofeedback



2. Literatuur



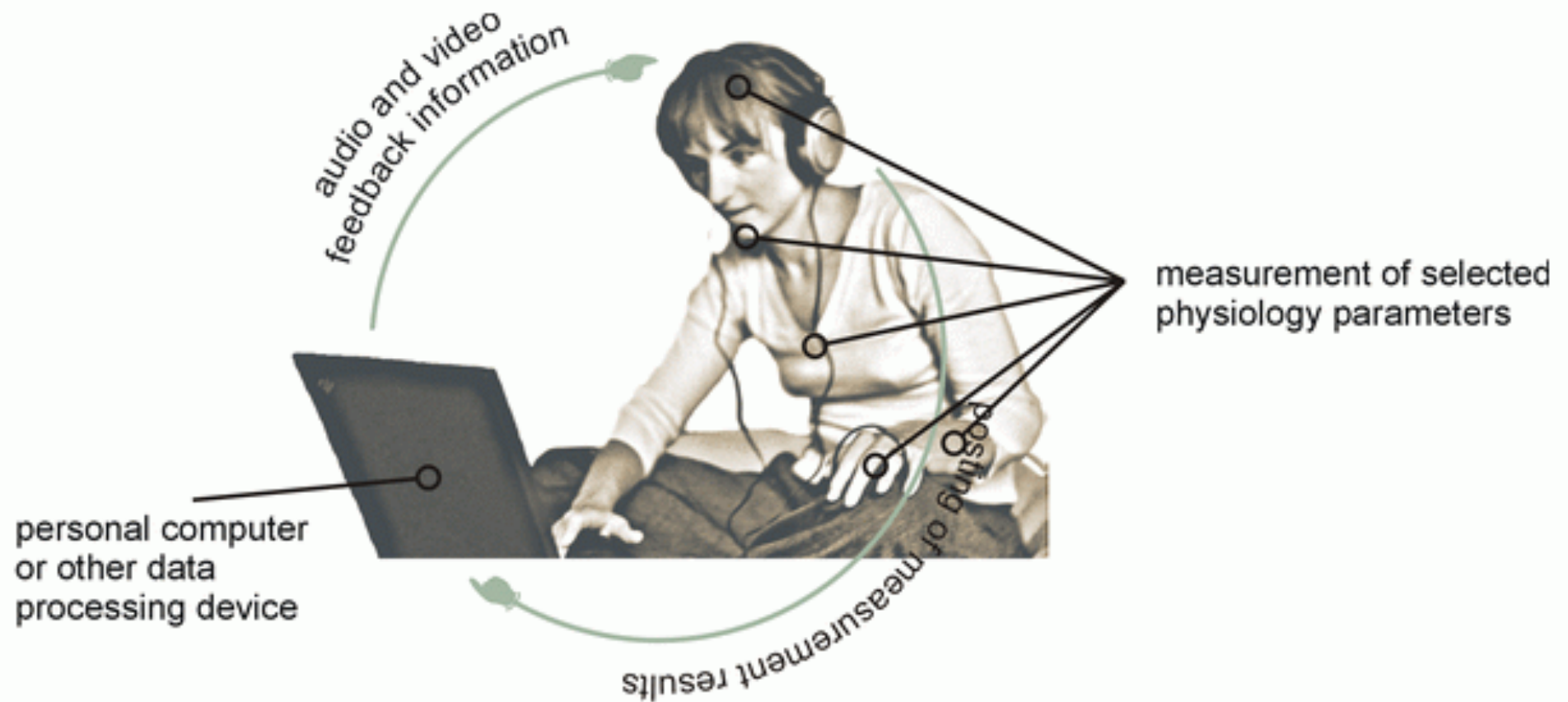
3. Het onderzoek



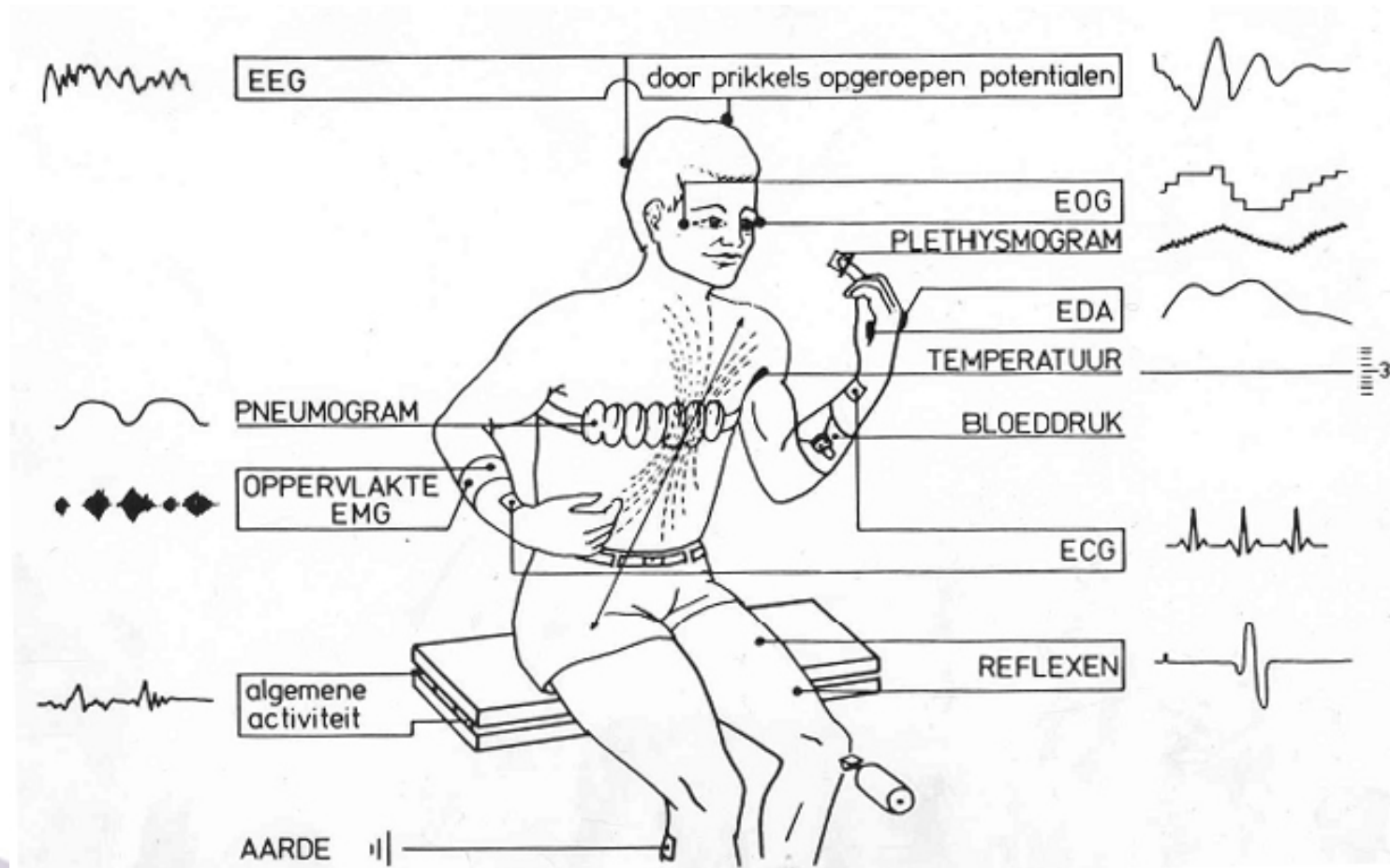
4. Conclusie



1. Neurofeedback Biofeedback



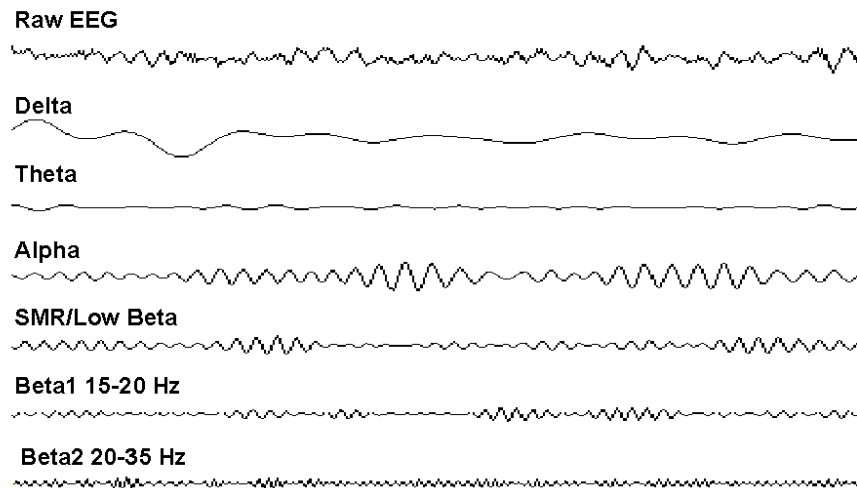
Voorbeelden van biofeedback



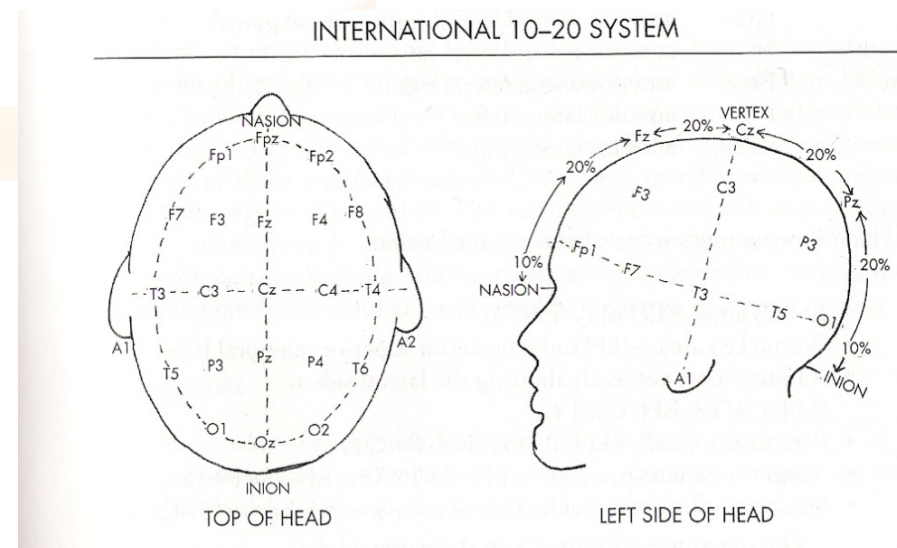
Twee aspecten

Frequentiegebied

Raw EEG & Its Components

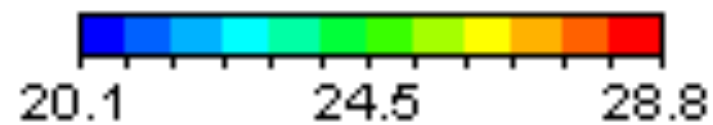
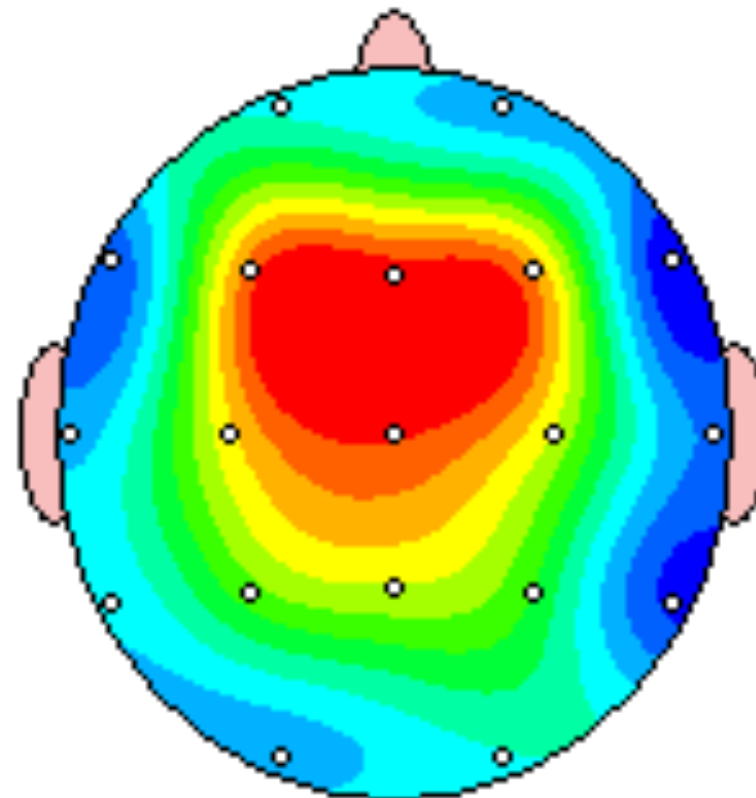


Plaats op het brein

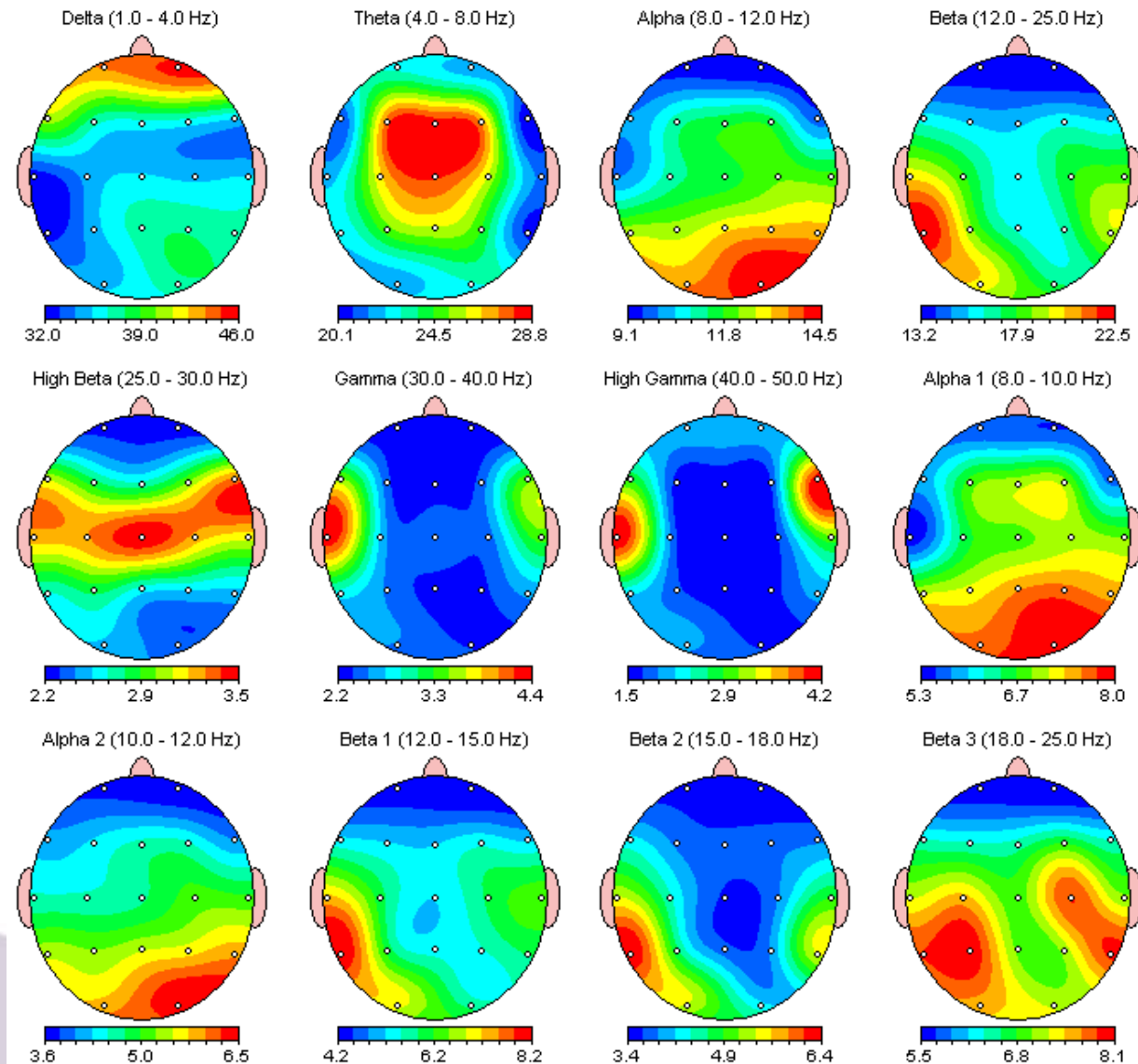


Voorbeeld Q-EEG I

Theta (4.0 - 8.0 Hz)



Voorbeeld Q-EEG II



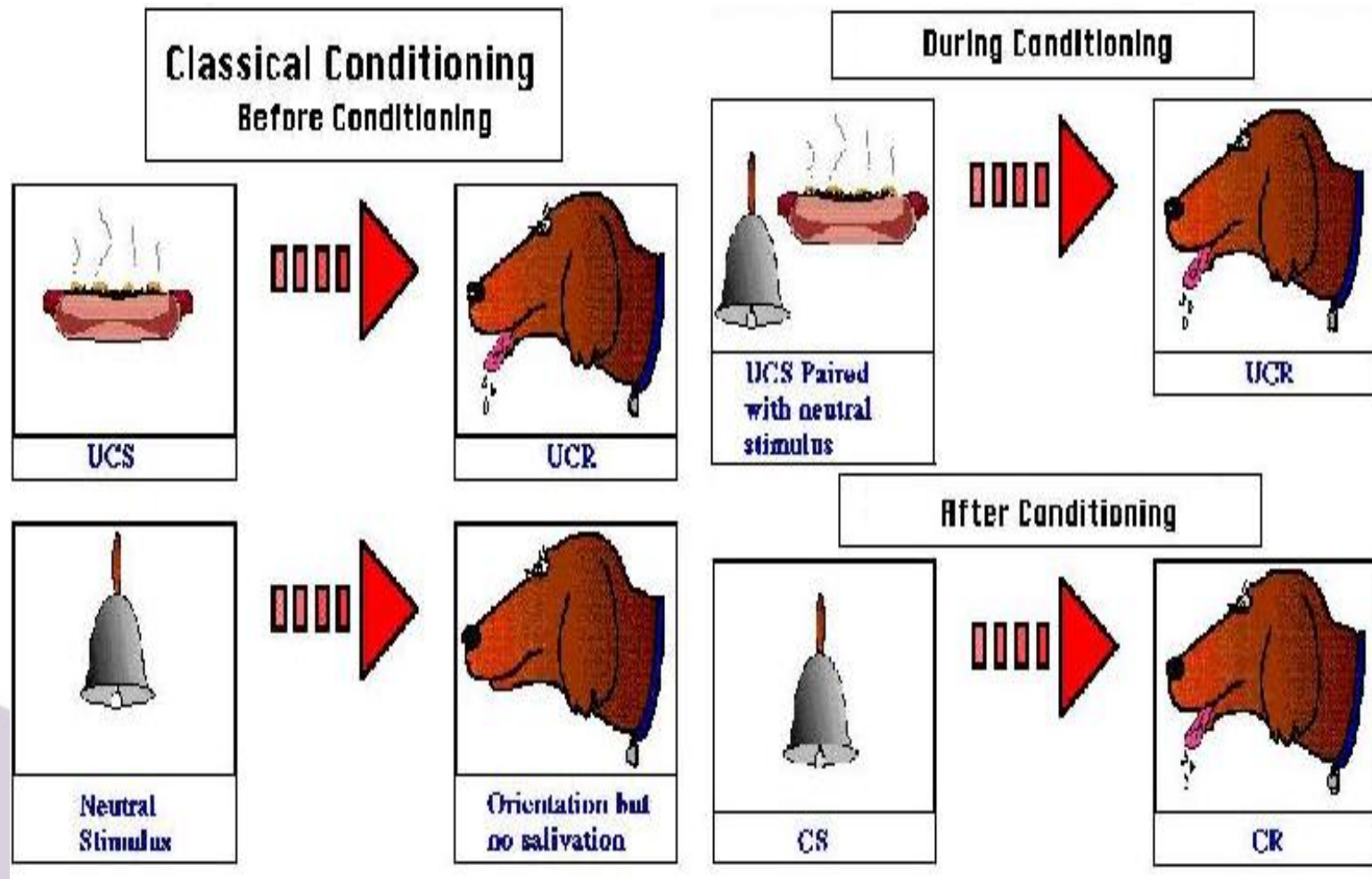


1. Neurofeedback

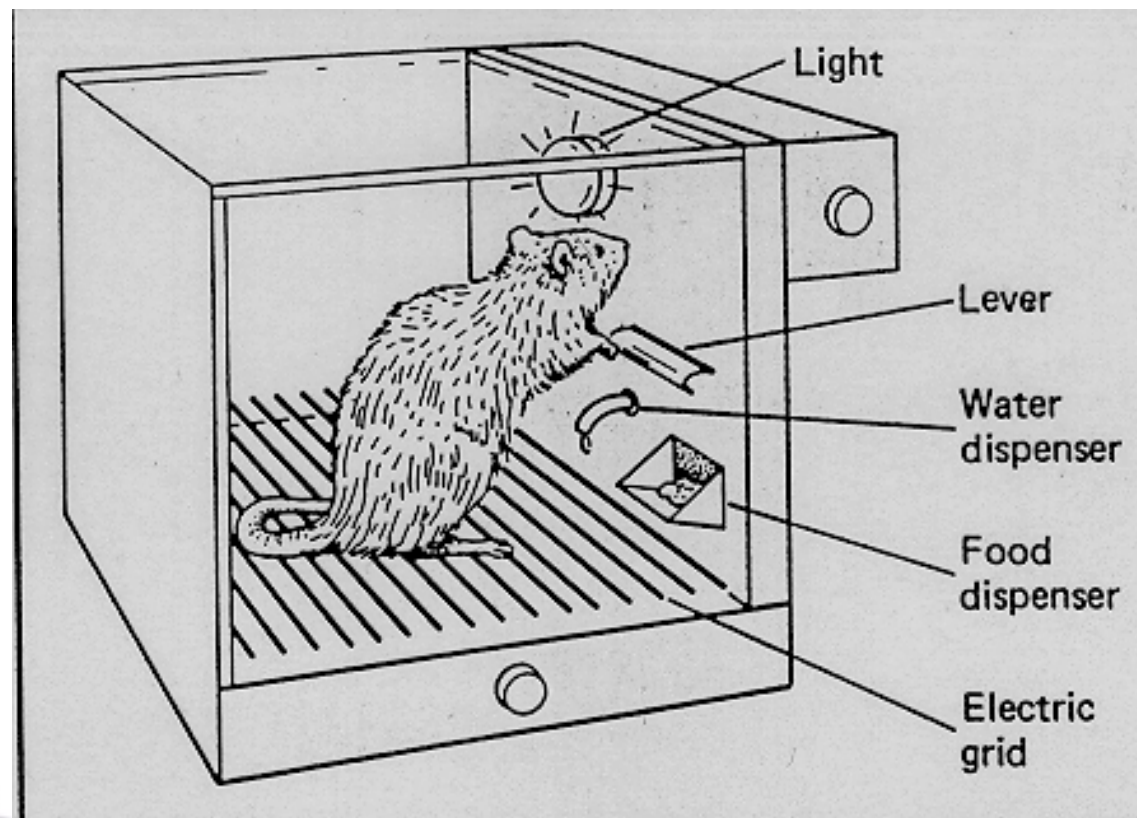
Klassiek Conditioneren



Klassiek Conditioneren



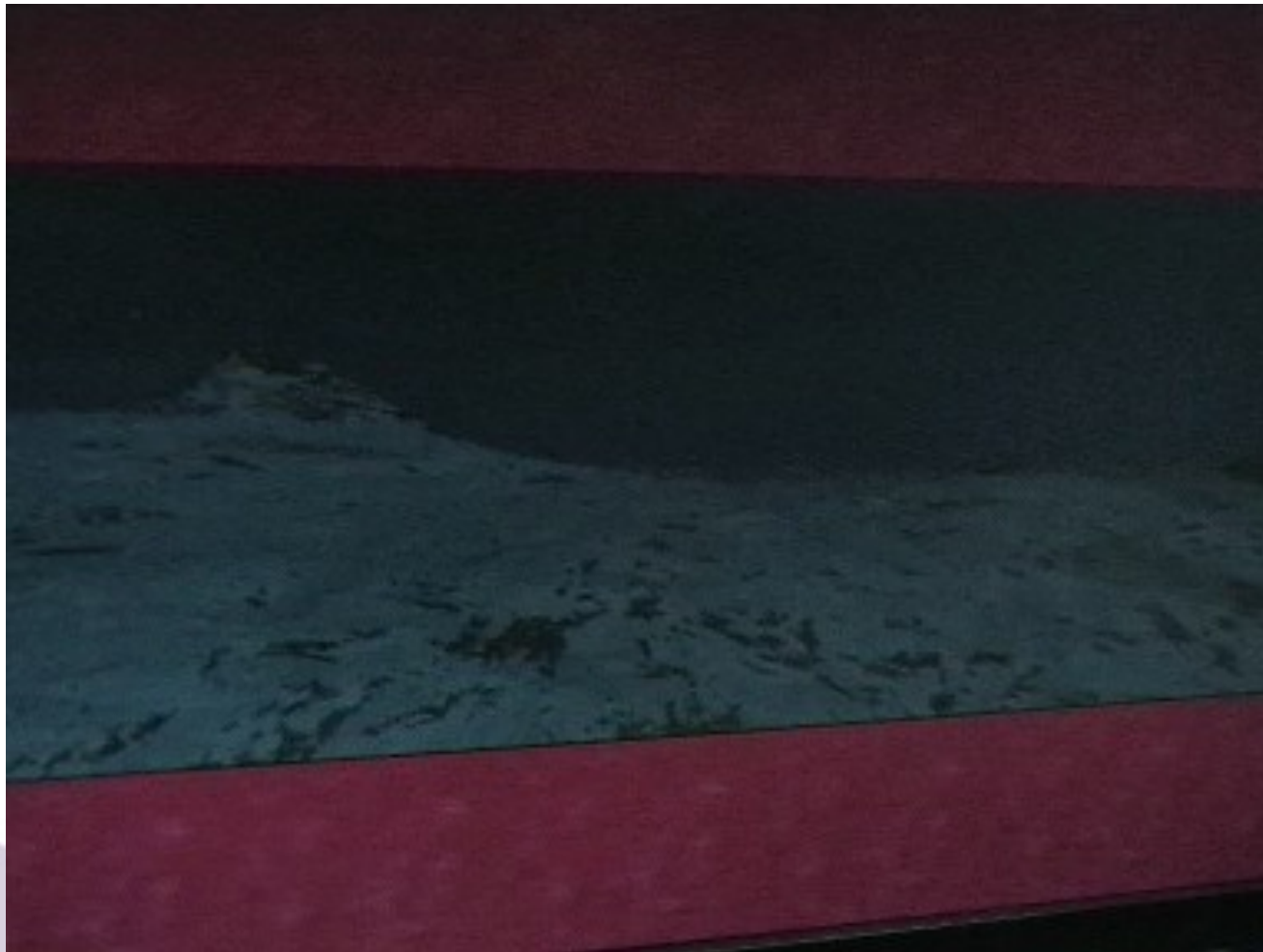
Operant conditioneren





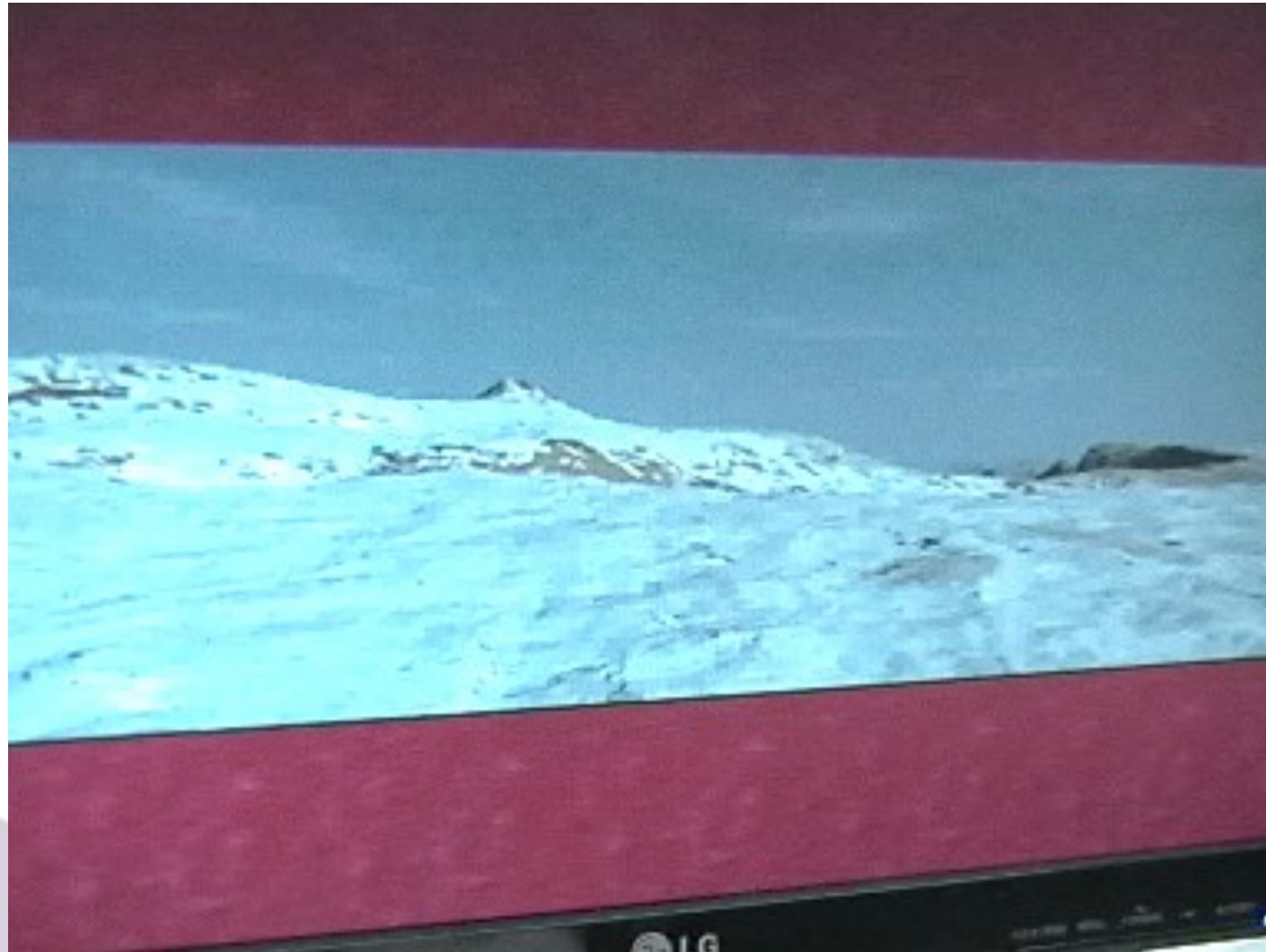
1. Neurofeedback

Geen bekrachtiging



1. Neurofeedback

Bekrachtiging: goed zicht

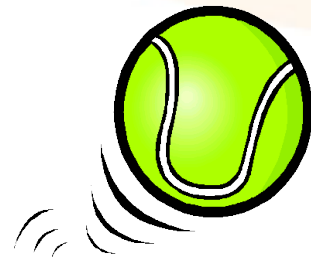


2. Literatuur

Algemeen

- Ontdekking neurofeedback, '70s

- Toepassingsgebieden



- Neurofeedback & ADHD





Veel kritiek

- Randomisatie
- Controlegroep
- Sample size
- Onvoldoende follow-up

- EEG veranderd?
- Volwassenen?



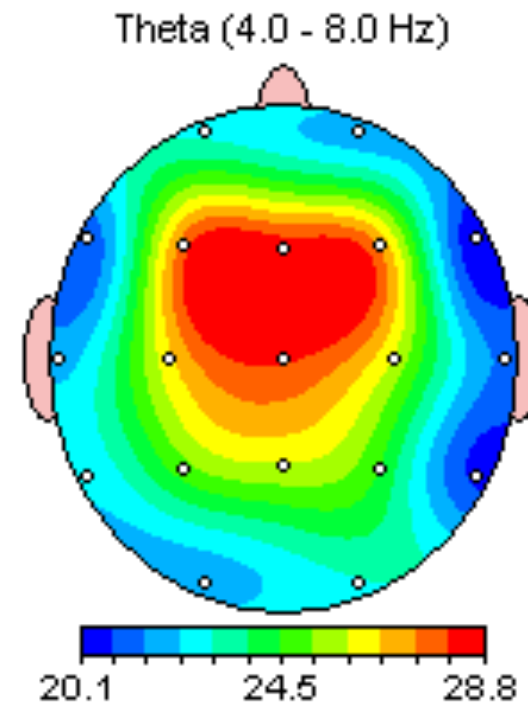
Fig. 3 A double-blind placebo-controlled clinical trial for CAM therapies.

Literatuur

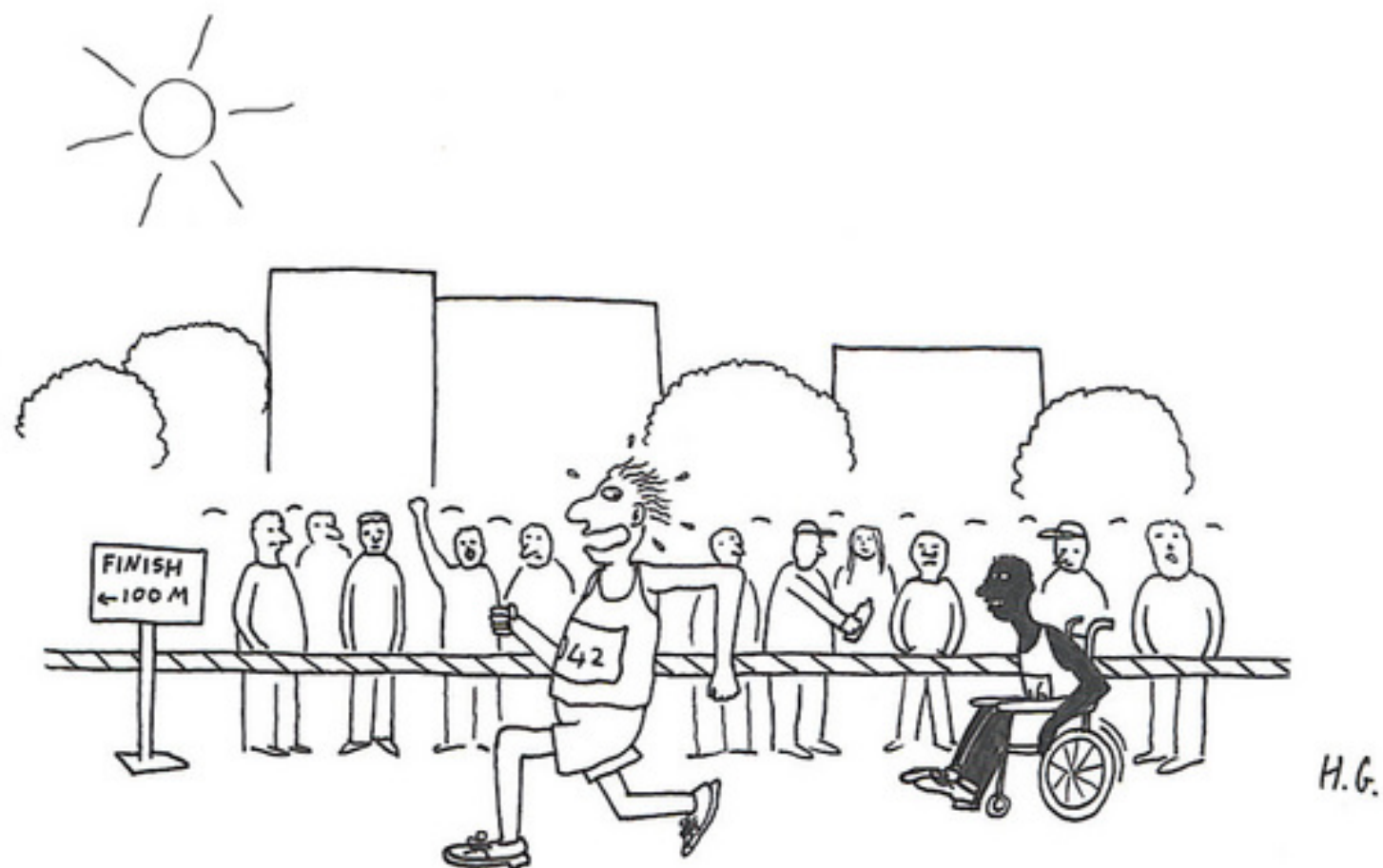
Specifiek

Onderzoek naar (Q)EEG:

- Bij kinderen
- Bij volwassenen







"Toch mooi een Keniaan voorgebleven!"

3. Het Onderzoek

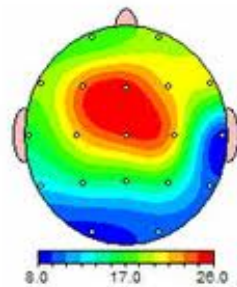
Volwassenen



ADHD



Q-EEG




**Klinische
verbetering**



Hypothese 1

Na behandeling van ADHD met neurofeedback, is er een verandering op het Q-EEG zichtbaar.



Hypothese 1

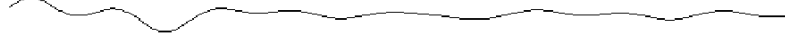
Na behandeling van ADHD met neurofeedback, is er een verandering op het Q-EEG zichtbaar.

Raw EEG & Its Components

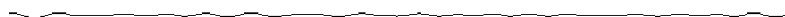
Raw EEG



Delta



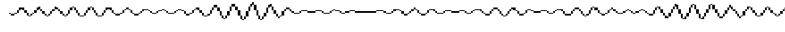
Theta



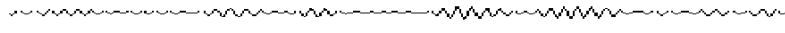
Alpha



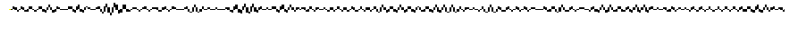
SMR/Low Beta



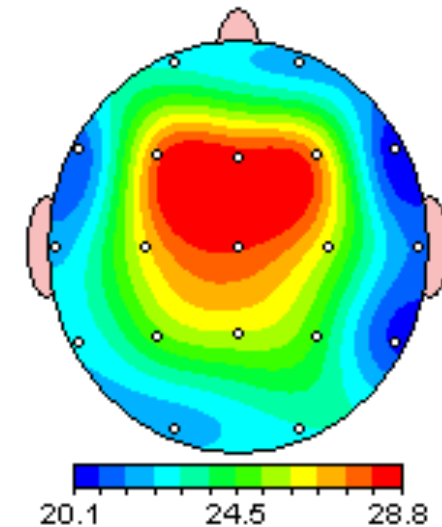
Beta1 15-20 Hz



Beta2 20-35 Hz



Theta (4.0 - 8.0 Hz)

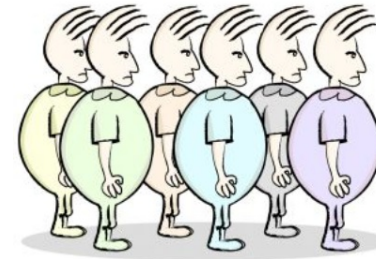


Hypothese 2

Behandeling met neurofeedback geeft een verbetering in score op de vragenlijsten (SCL-90, CGI).

Methode

Deelnemers



- **Inclusie** 10
- **Diagnostiek** DIVA – NPO – PO
- **Complexe groep**

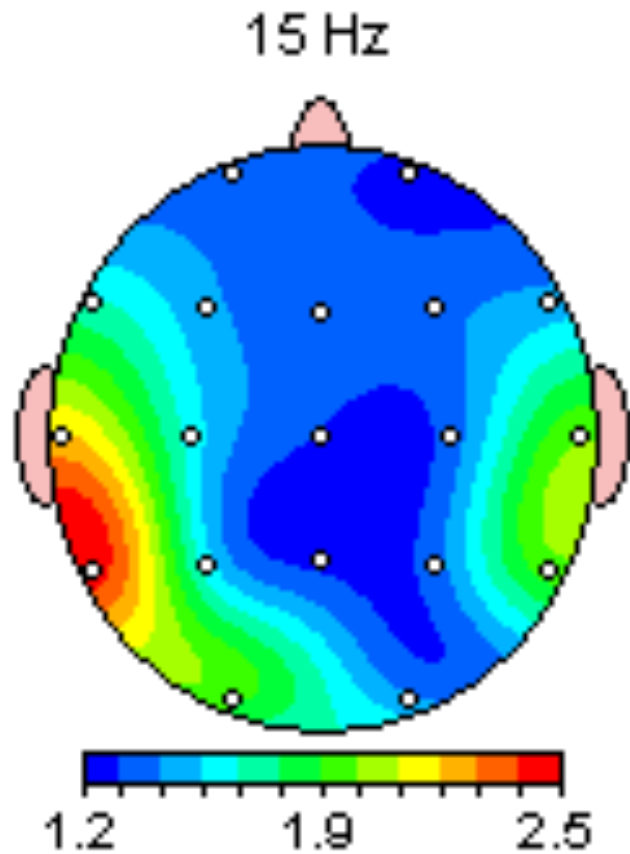
Methode

Deelnemers in detail

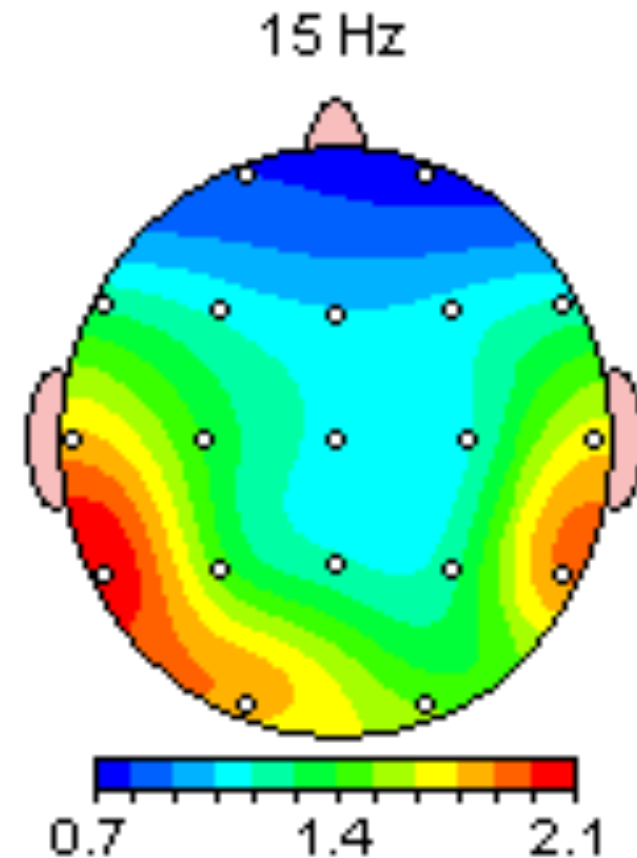


- **Geslacht:** 5 ♀ en 5 ♂
- **Leeftijd:** 26 - 53 jaar
- **Co-morbiditeit:** 9 / 10
- **ADHD Medicatie:** 9 / 10

Resultaten I



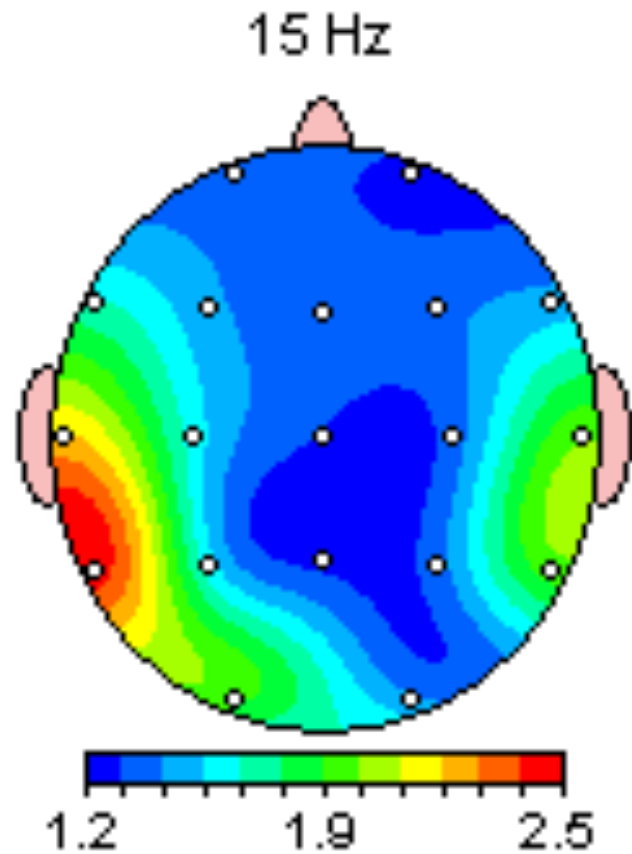
Cz 12-15 Hz ↑



Voor

Na

Resultaten II

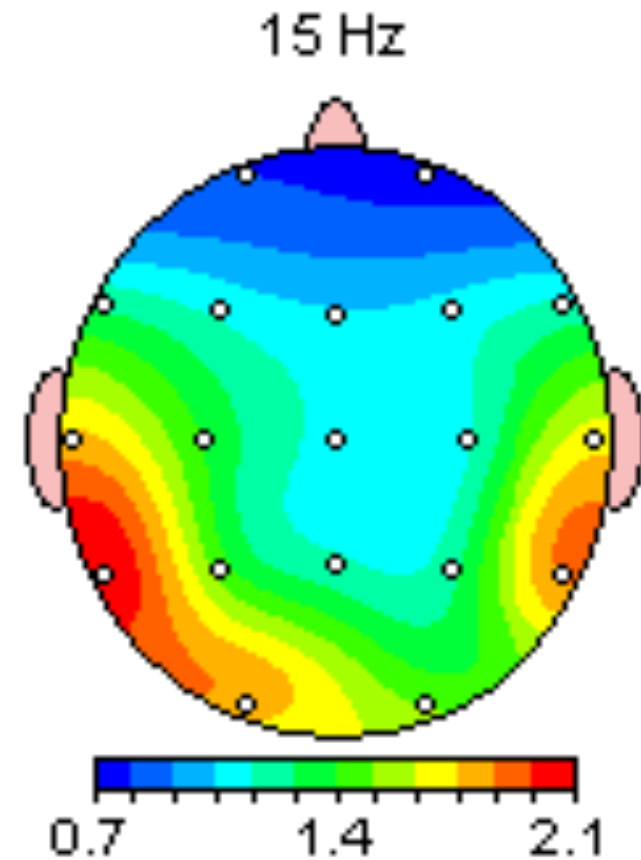


Voor

Cz 12-15 Hz ↑

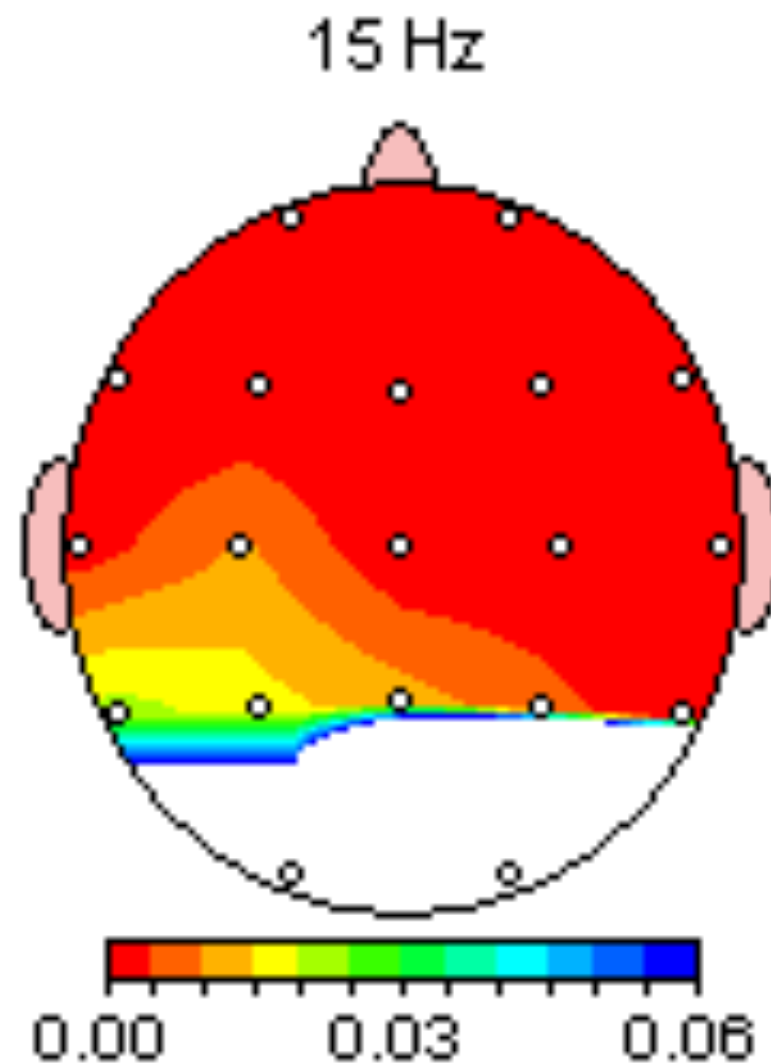
T3 4-6 Hz ↓

Etc.



Na

Resultaten III

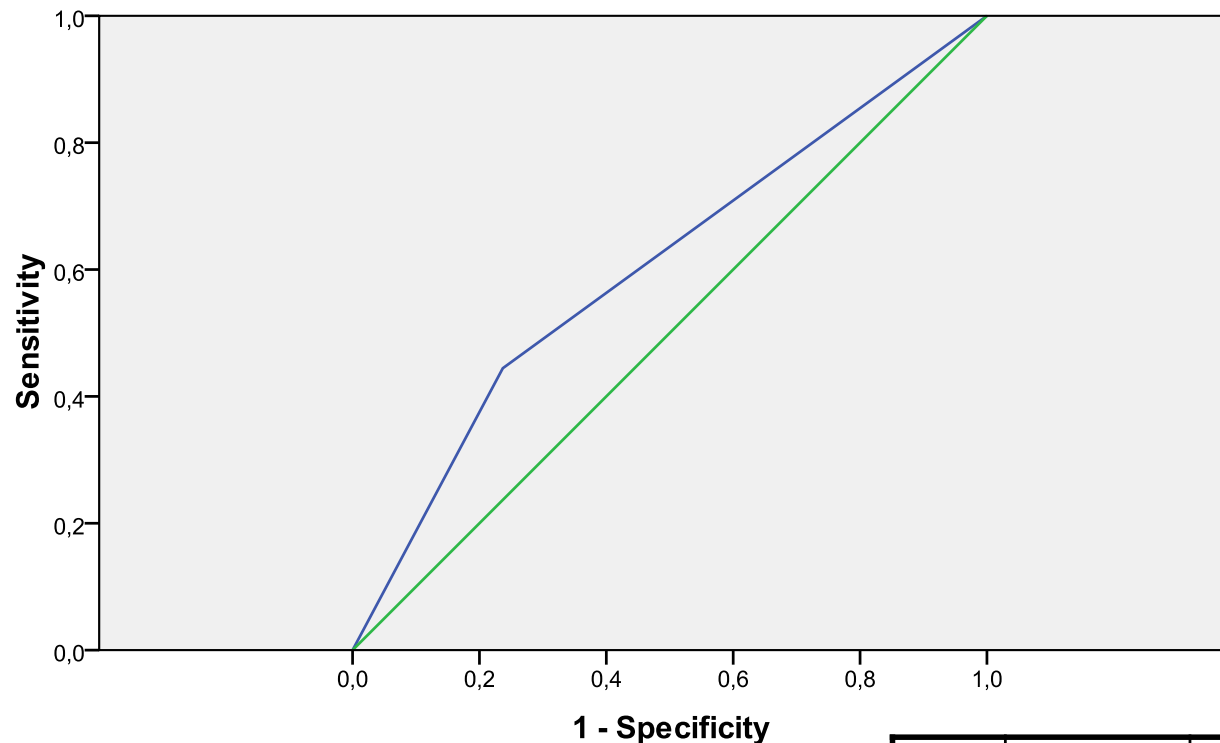


Resultaten IV

Area Under the Curve

ruwe scores

ROC Curve



N=168

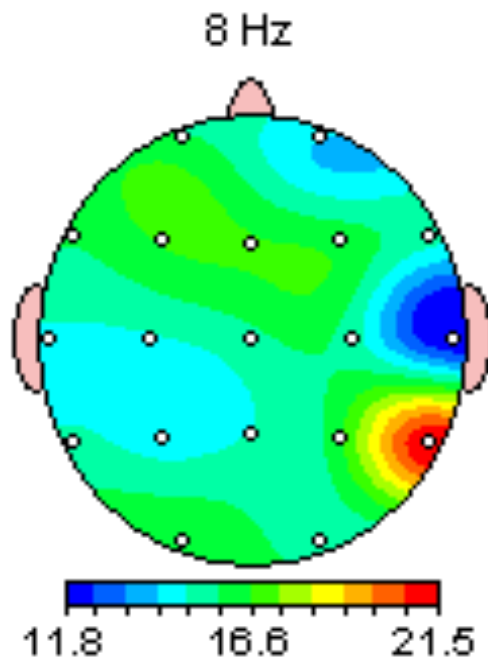
Diagonal segments are produced by ties.

Area	Standard Error	Significance	95% Confidence Interval	
			Lower Bound	Upper Bound
,604	,043	,017	,519	,689

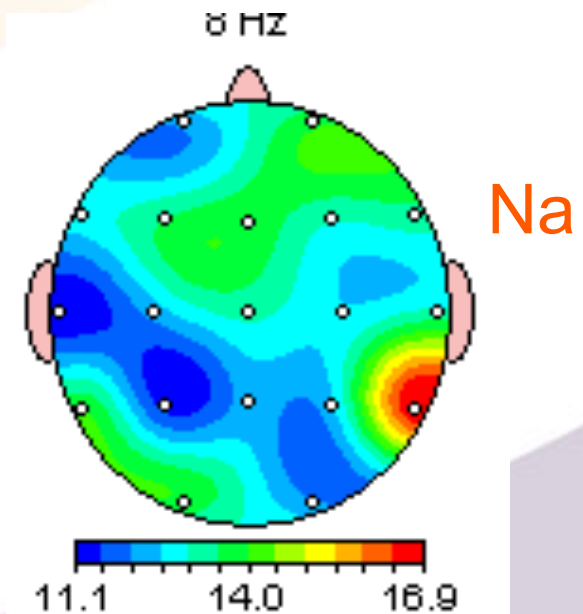
Resultaten V

Matig verband

Verklaring...?

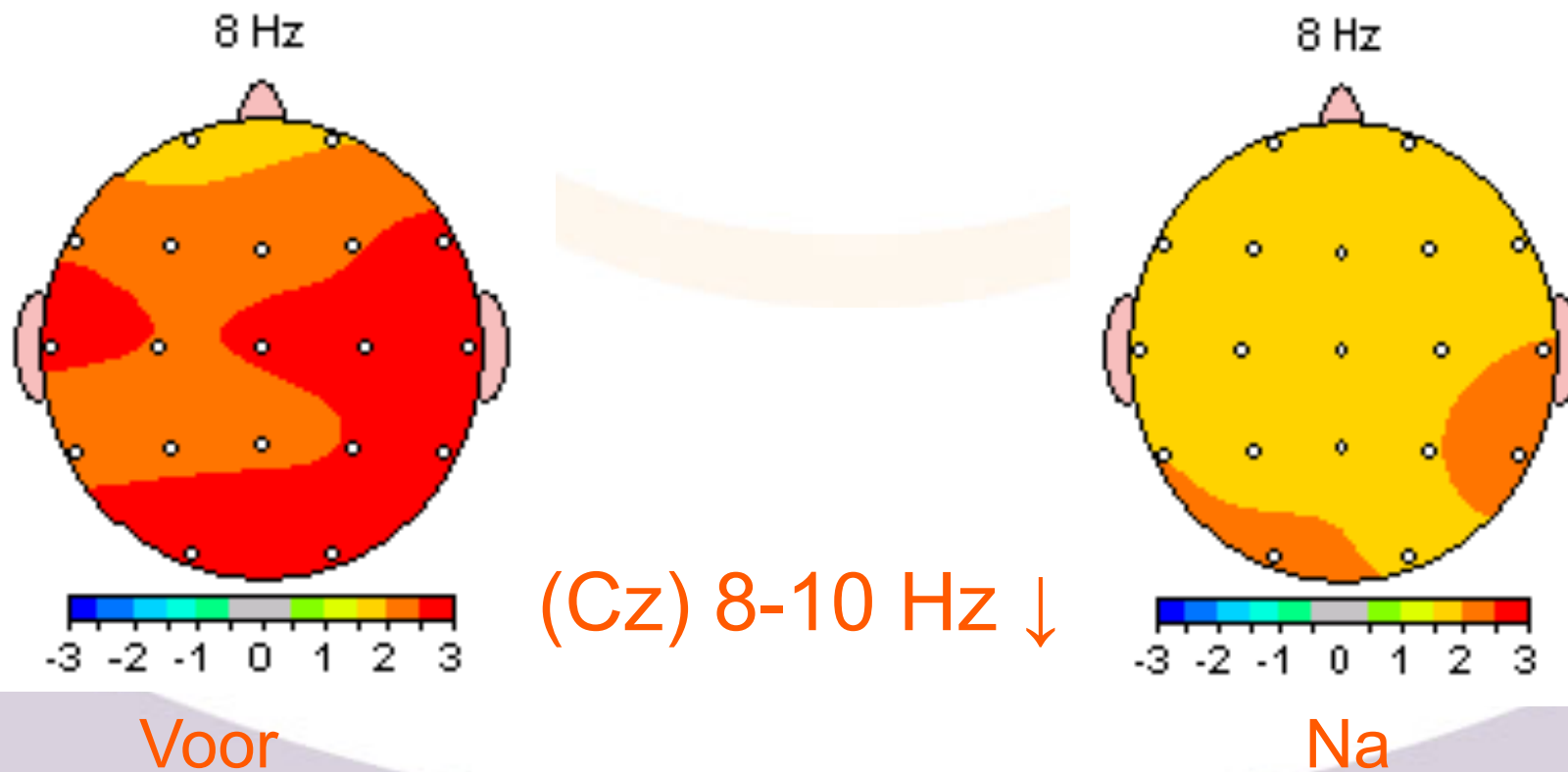


Cz 8-10 Hz ↓



Resultaten VI

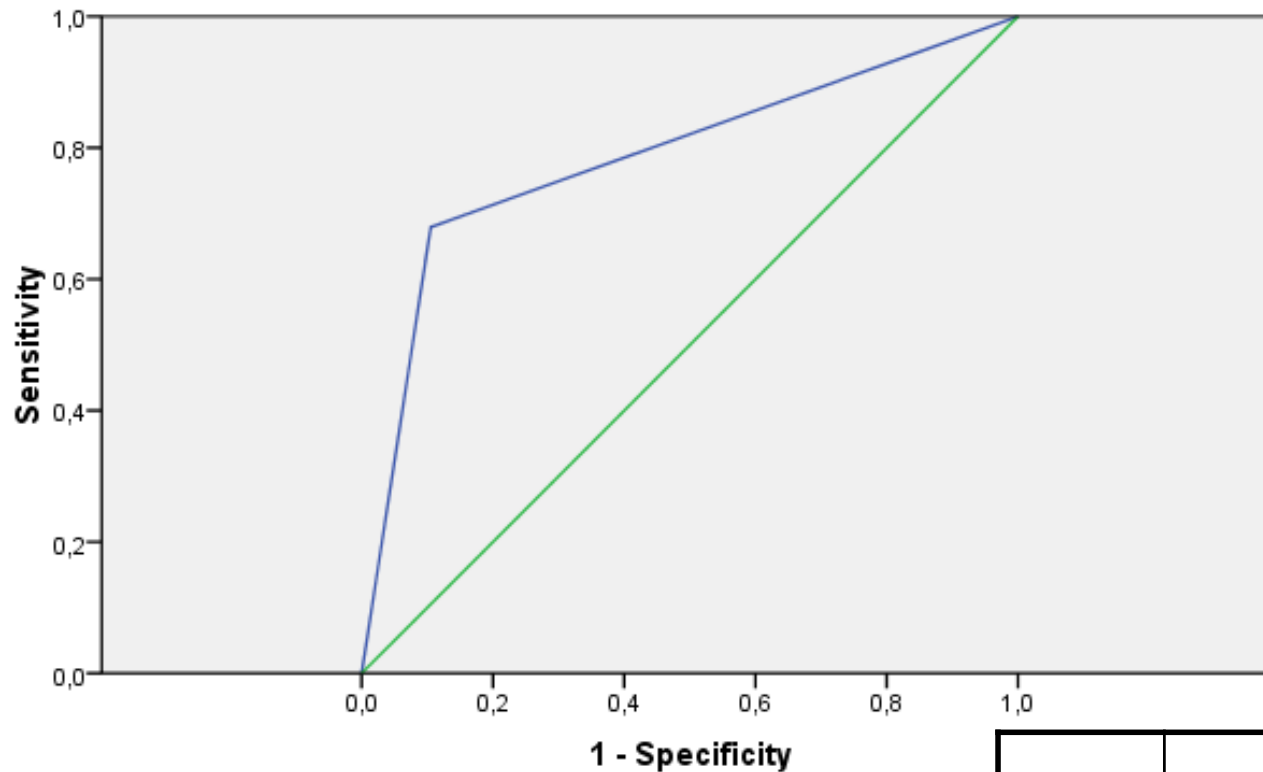
Z-scores, gehele brein



Resultaten VII

Area Under the Curve z-scores

ROC Curve



N=133

Diagonal segments are produced by ties.

Area	Standard Error	Significant	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
,787	,046	,000	,698	,876

Resultaten IV

Klinische verbetering



CGI:

6/9 veel – zeer veel verbeterd

SCL-90:

geen significant verschil

4. Conclusie

Hypothese 1

Na behandeling van ADHD met neurofeedback, is er een verandering op het Q-EEG zichtbaar.

Juist, vooral bij vergelijking t.o.v. de normgroep en over het gehele brein.

Hypothese 2

Behandeling met neurofeedback geeft een verbetering in score op de vragenlijsten (SCL-90, CGI).

Aanwijzingen voor effect bij volwassenen.

Slot

Wonderlijk middel of wondermiddel?



Dank

- **Steven Duinkerke**
- **Eric Noorthoorn**

