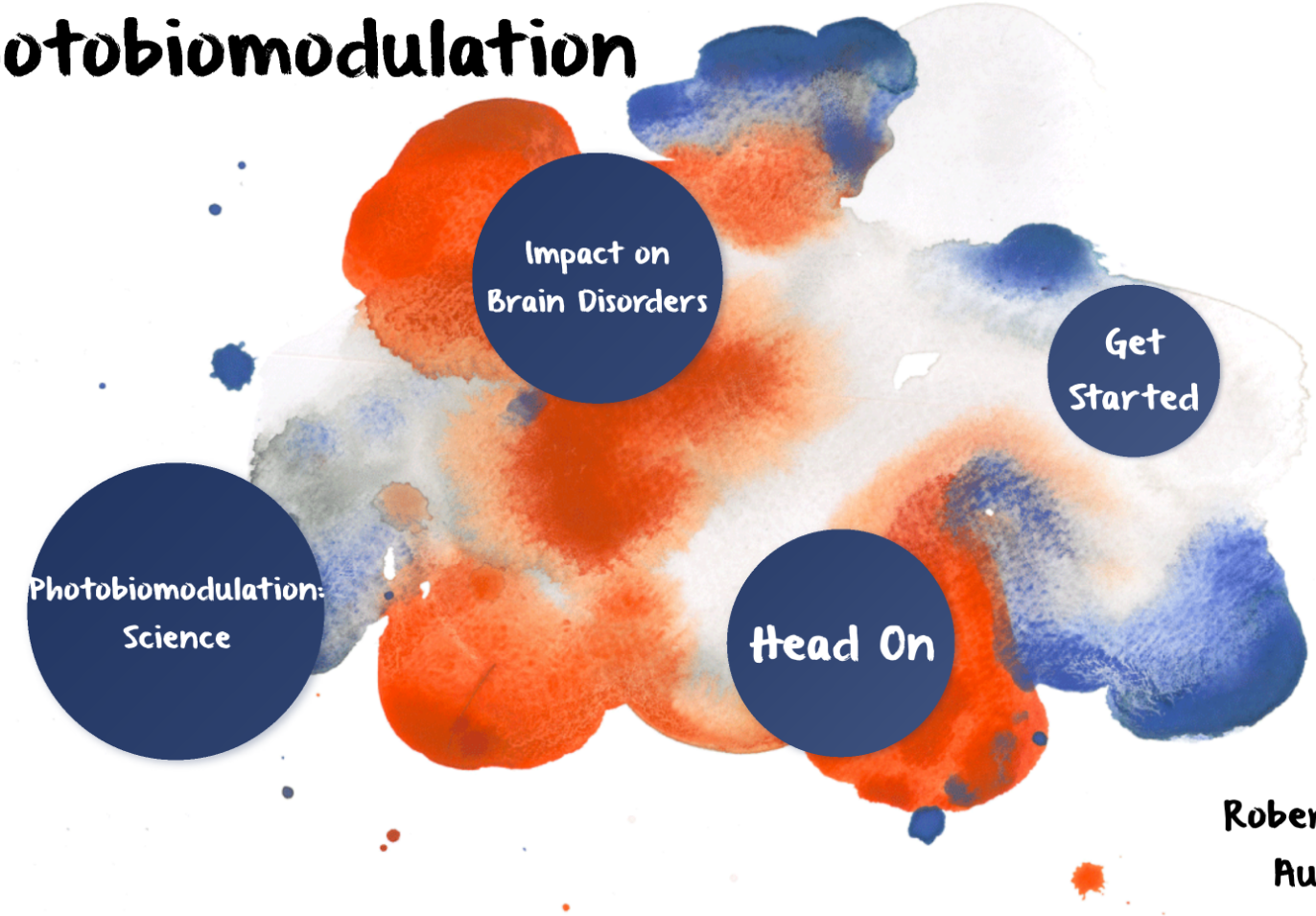
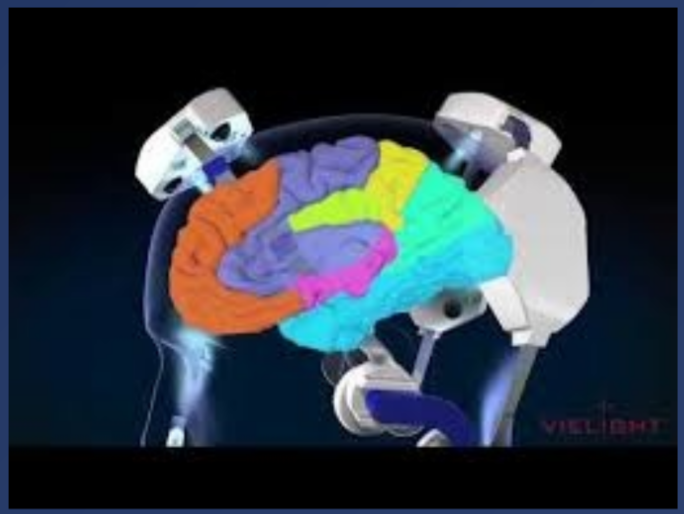
Photobiomodulation



Robert Coben, PhD

August 28, 2020

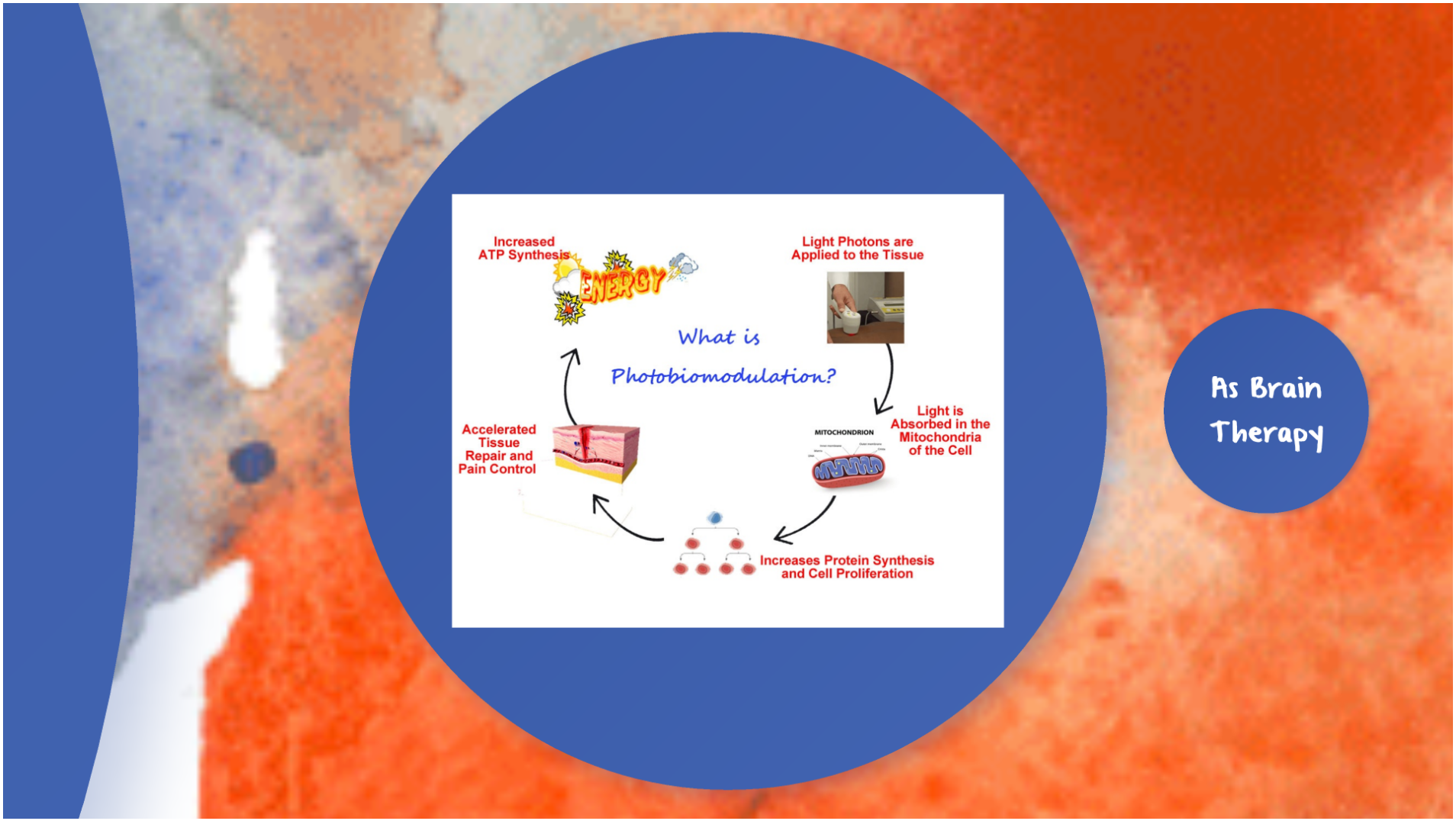
Vielight



Setup

Cranial and Nasal applications

Near Infrared Light Therapy


Increased
ATP Synthesis
ENERGY
Light Photons are
Applied to the Tissue
What is
Photobiomodulation?
Light is
Absorbed in the
Mitochondria
of the Cell
MITOCHONDRION
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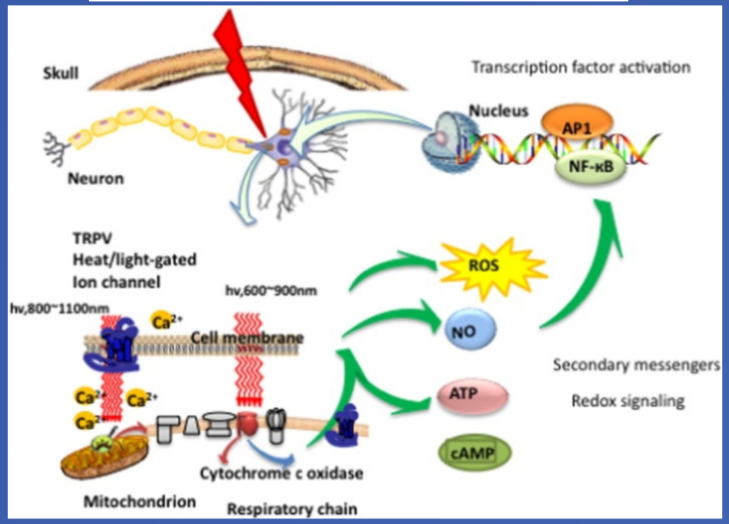
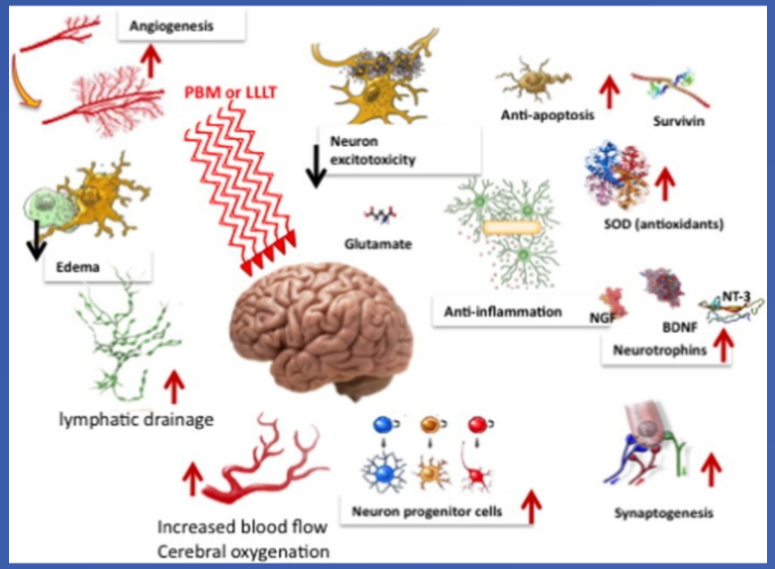
Michael R. Hamblin



Cellular impacts

Impact on Brain



Zomorrodi, R., Loheswaran, G., Pushparaj, A., & Lim, L. (2019). Pulsed near infrared transcranial and intranasal photobiomodulation significantly modulates neural oscillations: a pilot exploratory study. Scientific reports, 9(1), 1-11.

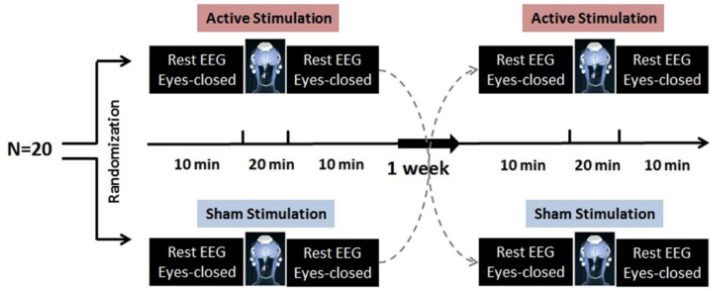


Figure 1. Schematic diagram of study design. Twenty healthy participants randomized to receive either active or sham tPBM with a minimum 1-week washout period between the two visits. 10 minutes eye-closed rest EEG recorded pre and post of each intervention.

Power changes active vs sham

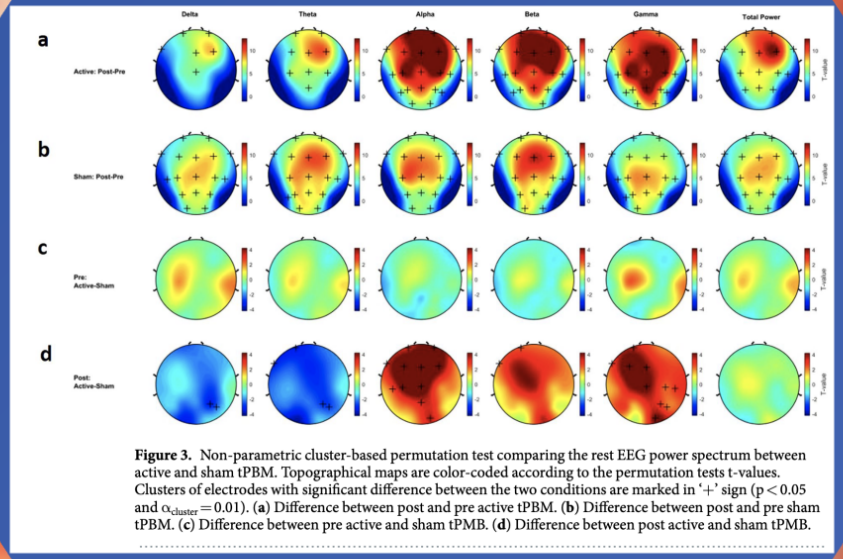


Figure 3. Non-parametric cluster-based permutation test comparing the rest EEG power spectrum between active and sham tPBM. Topographical maps are color-coded according to the permutation tests t-values. Clusters of electrodes with significant difference between the two conditions are marked in '+' sign ($p < 0.05$ and $\alpha_{cluster} = 0.01$). (**a**) Difference between post and pre active tPBM. (**b**) Difference between post and pre sham tPBM. (**c**) Difference between pre active and sham tPMB. (**d**) Difference between post active and sham tPMB.

Connectivity changes

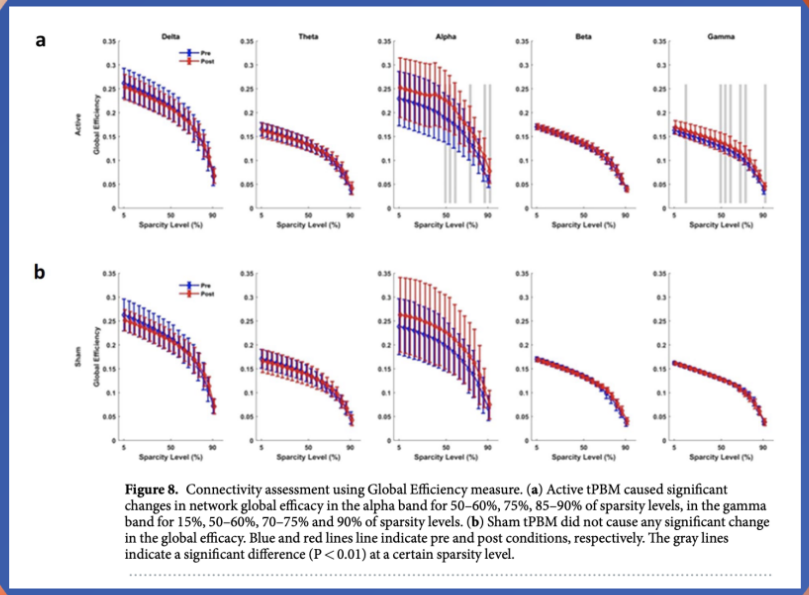
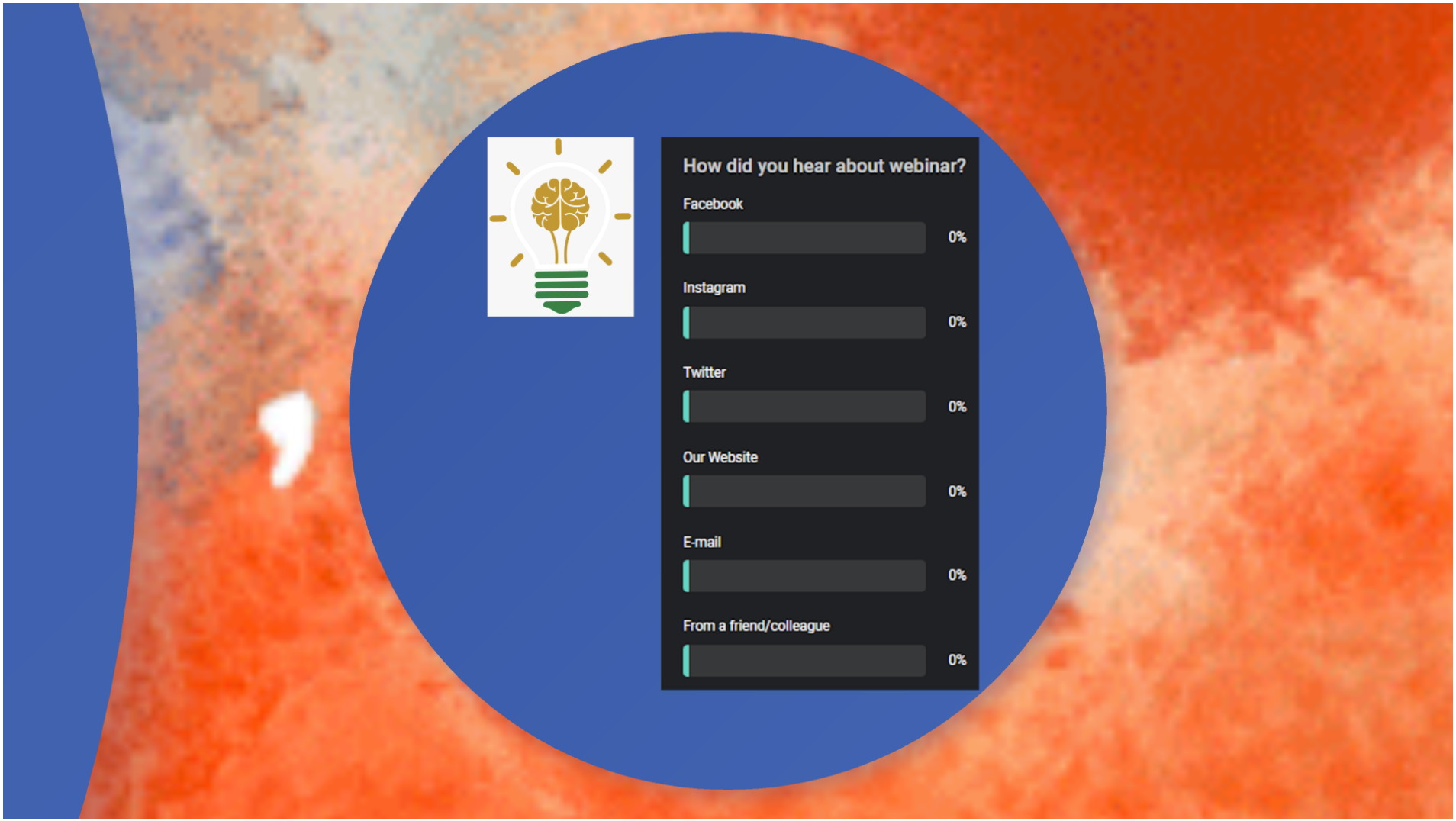
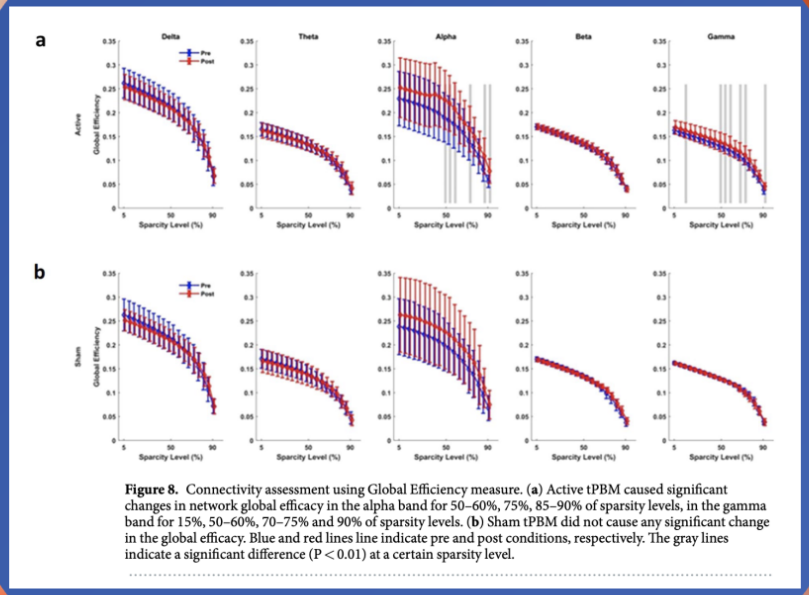


Figure 8. Connectivity assessment using Global Efficiency measure. (**a**) Active tPBM caused significant changes in network global efficacy in the alpha band for 50–60%, 75%, 85–90% of sparsity levels, in the gamma band for 15%, 50–60%, 70–75% and 90% of sparsity levels. (**b**) Sham tPBM did not cause any significant change in the global efficacy. Blue and red lines line indicate pre and post conditions, respectively. The gray lines indicate a significant difference ($P < 0.01$) at a certain sparsity level.

Administer Poll


How did you hear about webinar?
Facebook
0%
Instagram
0%
Twitter
0%
Our Website
0%
E-mail
0%
From a friend/colleague
0%



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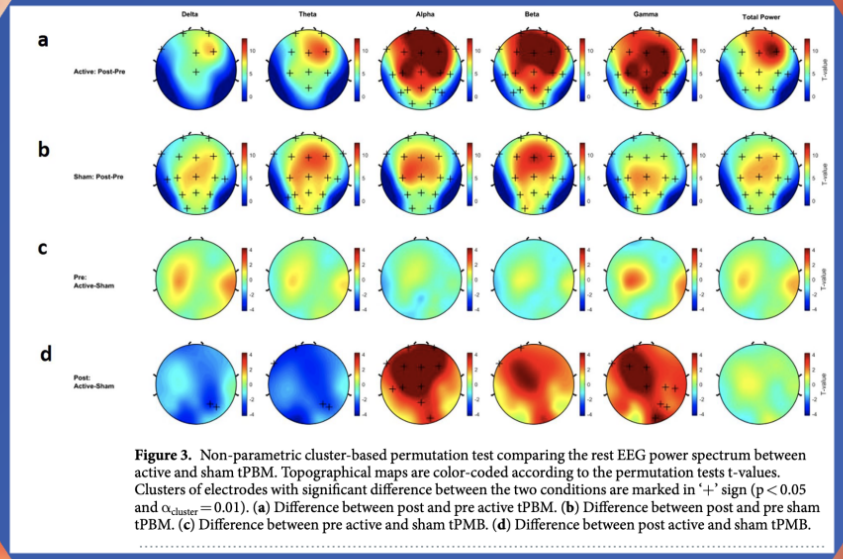

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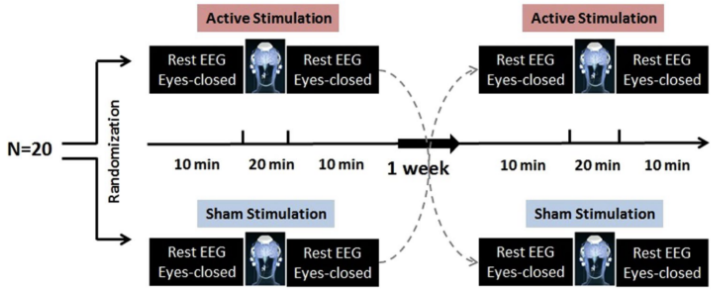

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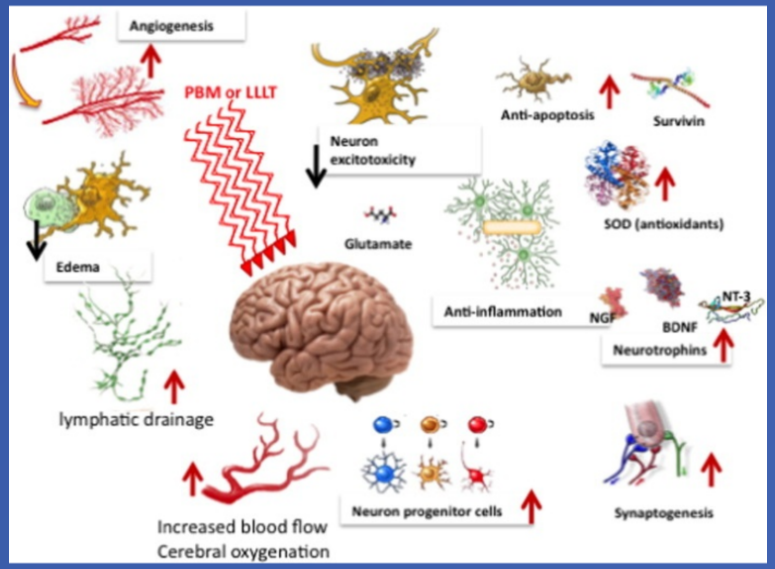

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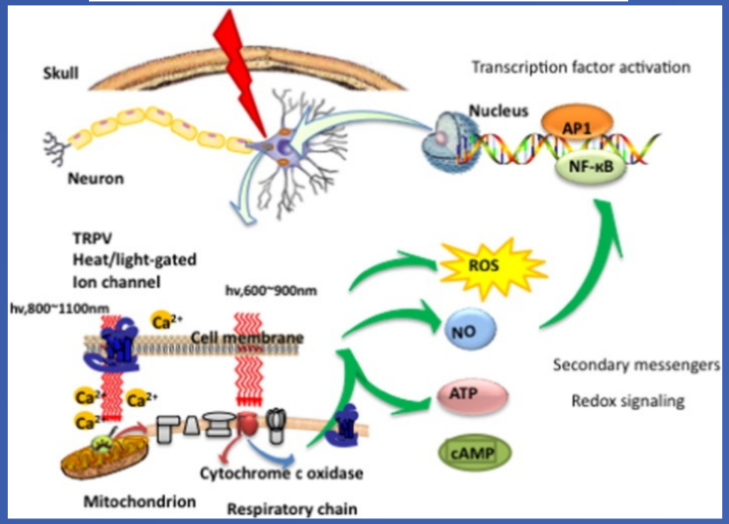
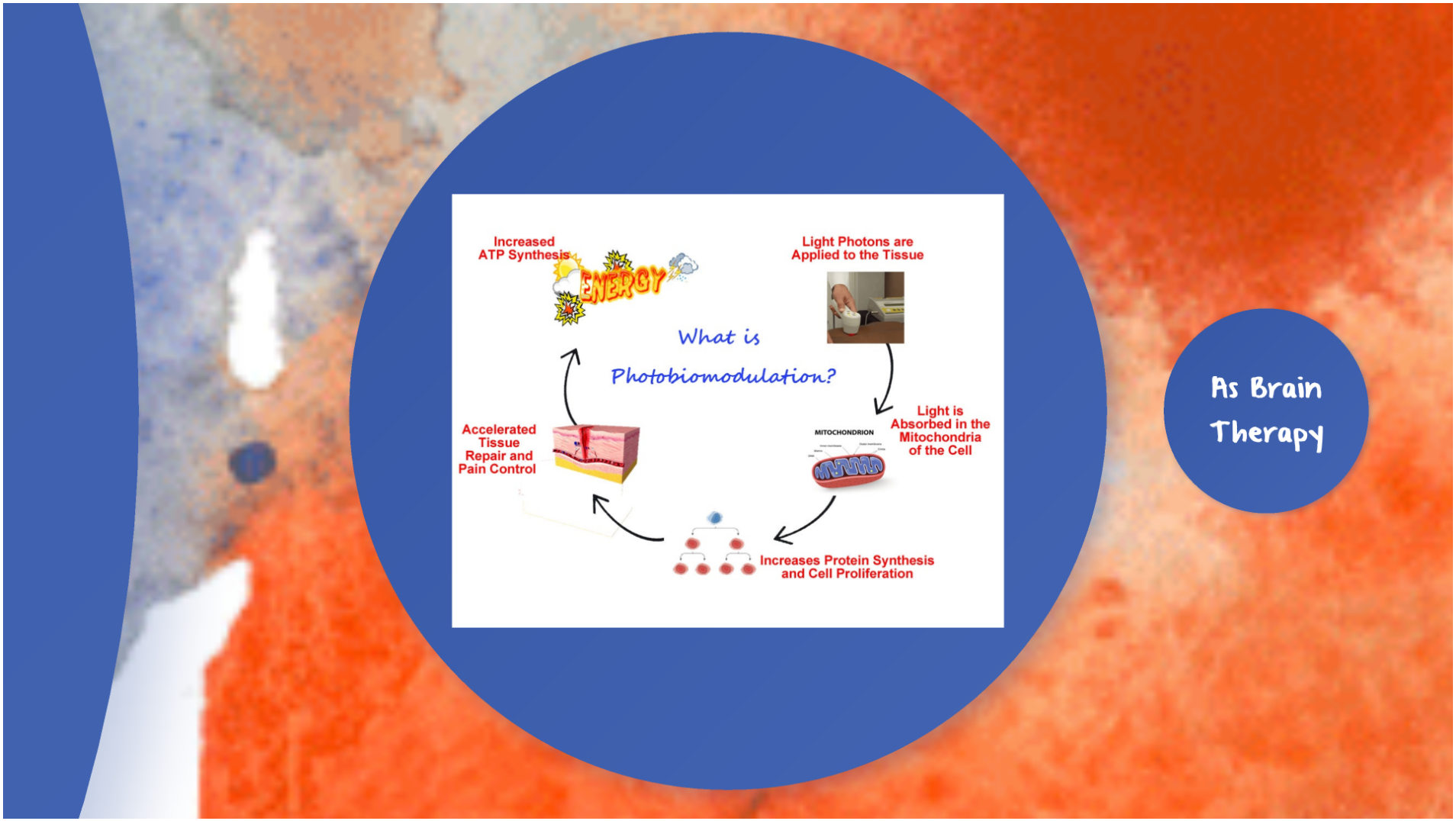


Cellular impacts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Cranial and Nasal applications

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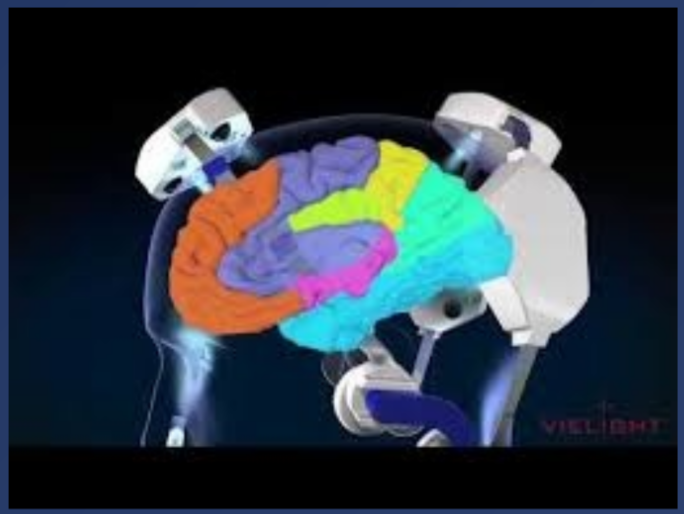
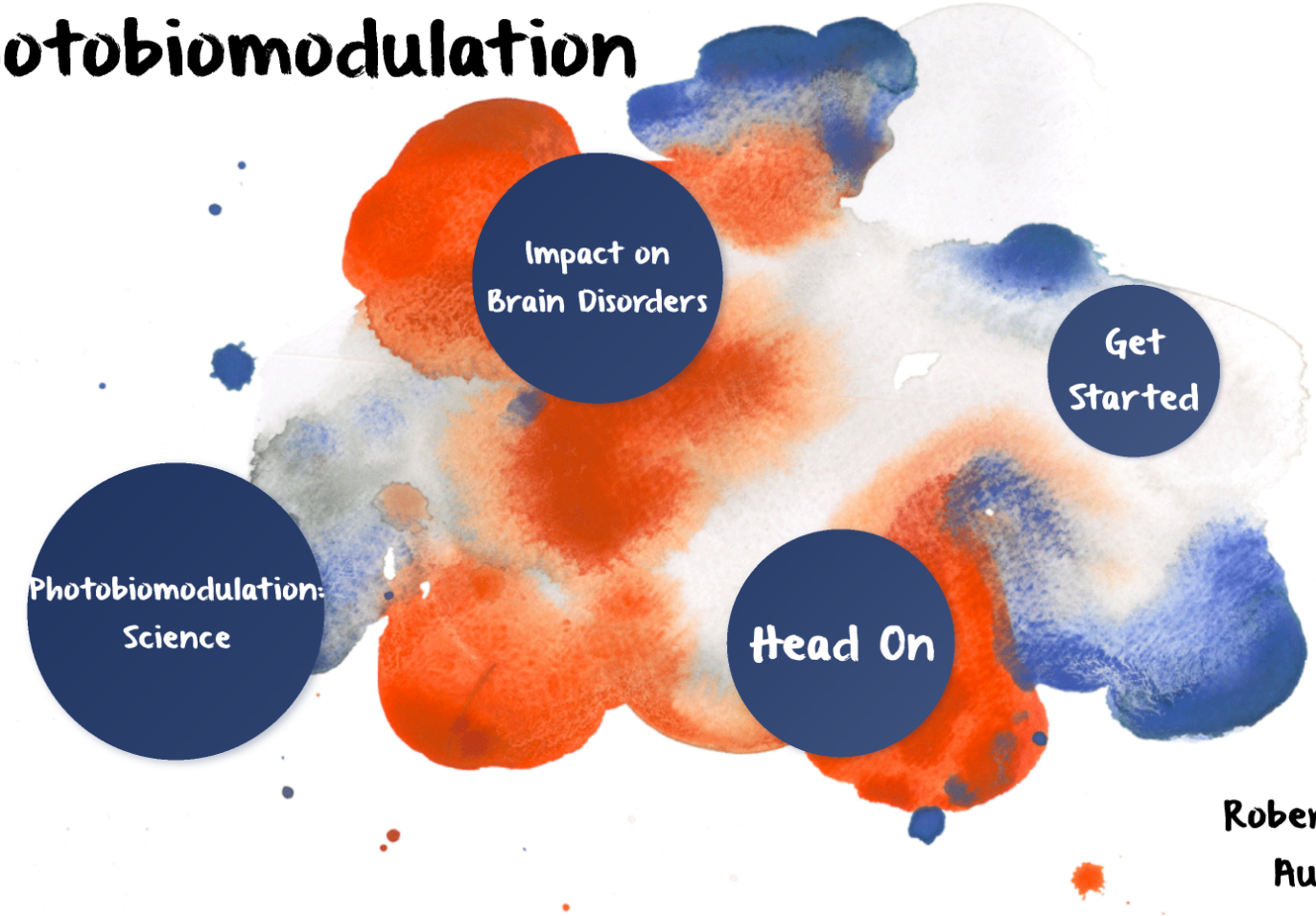
Vielight



Setup

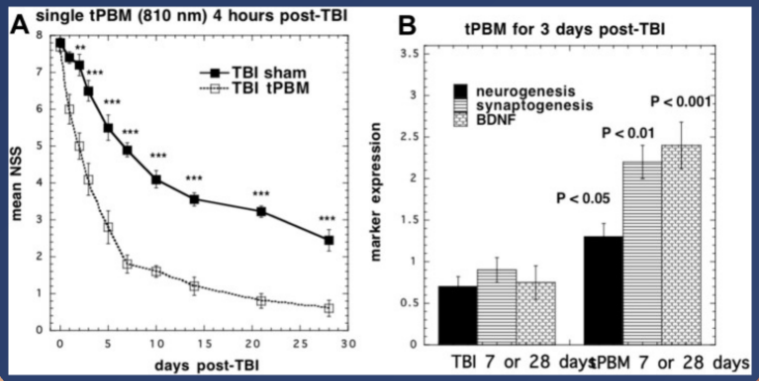
Photobiomodulation



Robert Coben, PhD

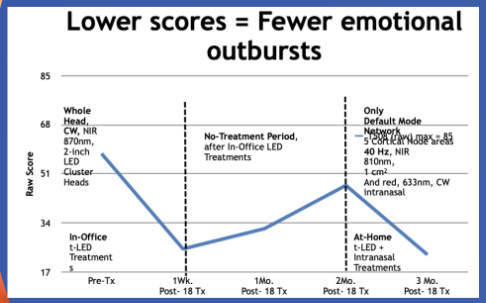
August 28, 2020

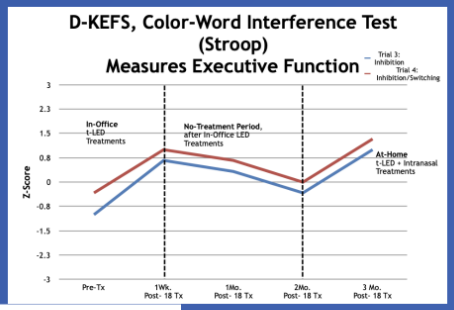
Traumatic Brain Injury



CTE case studies

Transcranial, Near-infrared Photobiomodulation to Improve Cognition in Two, Retired Professional Football Players Possibly Developing CTE
Poster, International Brain Injury Association (IBIA) Meeting, Toronto, March 2019
M.A. Naeser1,2, P.I. Martin1,2, M.D. Ho1, M.H. Krengel1,2,Y. Bogdanova1,3, J.A. Knight1, A.E. Fedoruk1, M.R. Hamblin4, B.B. Koo2

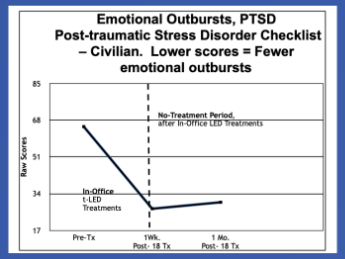


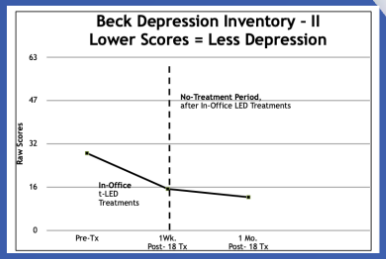


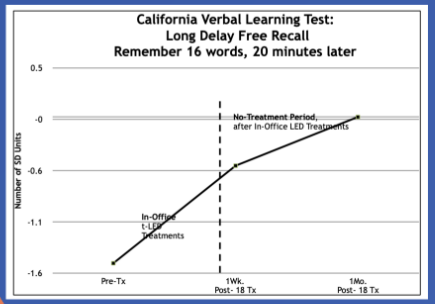
Case 2 CTE

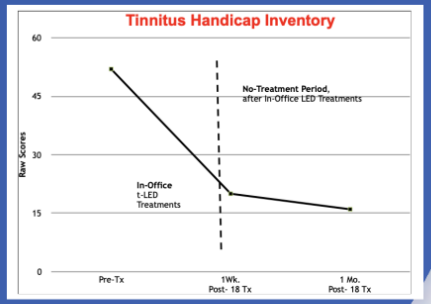
Resting-state functional-connectivity MRI

Before LED Tx.	1 wk After In-Office LED	1 mo After In-Office LED	3 mo After In-Office LED	After 3 mo In-Home LED
1127 (10)	1243 (11)	1693 (16)	1268 (12)	1443 (13)


Emotional Outbursts, PTSD
Post-traumatic Stress Disorder Checklist – Civilian. Lower scores = Fewer emotional outbursts
Raw Scores
85
68
51
34
17
No-Treatment Period, after In-Office LED Treatments
In-Office t-LED Treatments
Pre-Tx
1Wk. Post- 18 Tx
1 Mo. Post- 18 Tx


Beck Depression Inventory - II
Lower Scores = Less Depression
Raw Scores
63
47
32
16
0
No-Treatment Period, after In-Office LED Treatments
In-Office t-LED Treatments
Pre-Tx
1Wk. Post- 18 Tx
1 Mo. Post- 18 Tx


California Verbal Learning Test:
Long Delay Free Recall
Remember 16 words, 20 minutes later
Number of SD Units
0.5
-0
-0.6
-1.1
-1.6
No-Treatment Period, after In-Office LED Treatments
In-Office t-LED Treatments
Pre-Tx
1Wk. Post- 18 Tx
1Mo. Post- 18 Tx


Tinnitus Handicap Inventory
Raw Scores
60
45
30
15
0
No-Treatment Period, after In-Office LED Treatments
In-Office t-LED Treatments
Pre-Tx
1Wk. Post- 18 Tx
1 Mo. Post- 18 Tx

Dementia

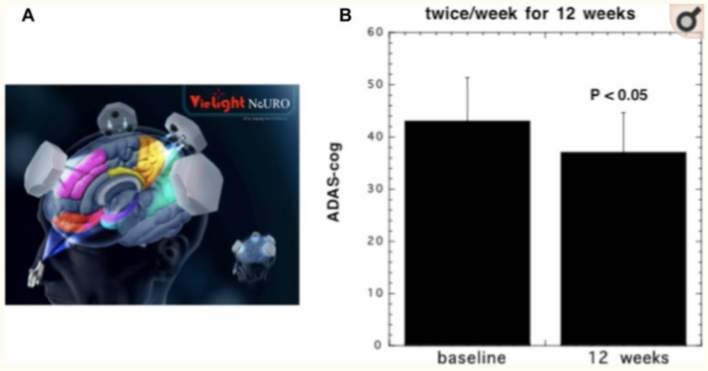


Fig. 5

tPBM for Alzheimer's disease. (A) Nineteen patients were randomized to receive real or sham tPBM (810 nm LED, 24.6 J/cm^2 at 41 mW/cm^2). (B) Significant decline in ADAS-cog (improved cognitive performance) in real but not sham (unpublished data).

Small Pilot Study

Photobiomodulation, Photomedicine, and Laser Surgery
Volume XX, Number XX, 2019
© Mary Ann Liebert, Inc.
Pp. 1–9
DOI: 10.1089/photob.2018.4555

Original Research

Effects of Home Photobiomodulation Treatments on Cognitive and Behavioral Function, Cerebral Perfusion, and Resting-State Functional Connectivity in Patients with Dementia: A Pilot Trial

Linda L. Chao, PhD[1–3]

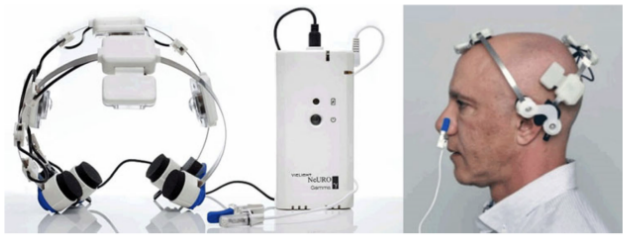


FIG. 1. Vielight Neuro Gamma device (left) and photograph illustrating positions of the device LEDs during treatment (right). Figure courtesy of Vielight, Inc. LED, light emitting diode.

FIG. 2. Approximate position of the Vielight Neuro Gamma transcranial LEDs on the FreeSurfer ROIs. The precentral ROI was used as a control region in analysis of the perfusion data. ROI, regions of interest.

Symptom changes

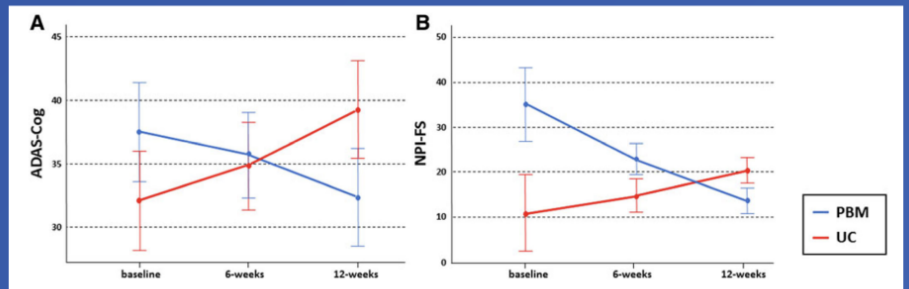


FIG. 3. Mean (±SEM) ADAS-cog **(A)** and NPI-FS **(B)** scores in the PBM (blue line) and Usual Care (red line) groups by time. Lower scores on both measures indicate better function. ADAS-cog, Alzheimer's Disease Assessment Scale-cognitive; NPI-FS, Neuropsychiatric Inventory frequency severity; SEM, standard error of the mean; PBM, photobiomodulation.

Neuroimaging

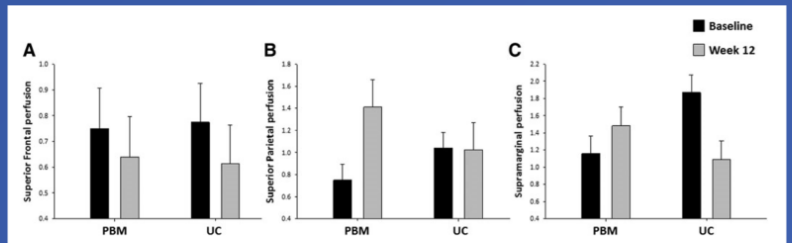


FIG. 4. Arterial spin-labeled perfusion values, normalized to the precentral ROI, from the superior frontal **(A)**, superior parietal **(B)**, and supramarginal **(C)** ROIs at baseline (black bar) and week 12 (gray bar) by group. Error bars are SEM.

TABLE 4. STRENGTH OF CONNECTIVITY BETWEEN THE POSTERIOR CINGULATE CORTEX (SEED) AND LATERAL PARIETAL CORTEX BY GROUP AND TIME

	PBM		*UC*	
	Baseline	*Week 12*	*Baseline*	*Week 12*
PCC–left LP	$T(3)=4.25$ $P_{unc}=0.02$ $P_{FDR}=0.07$	$T(3)=14.15$ $P_{unc}=0.0008$ $P_{FDR}=0.004$	$T(3)=6.88$ $P_{unc}=0.006$ $P_{FDR}=0.02$	$T(3)=3.86$ $P_{unc}=0.03$ $P_{FDR}=0.08$
PCC–right LP	$T(3)=3.98$ $P_{unc}=0.03$ $P_{FDR}=0.07$	$T(3)=11.17$ $P_{unc}=0.002$ $P_{FDR}=0.004$	$T(3)=8.34$ $P_{unc}=0.004$ $P_{FDR}=0.02$	$T(3)=5.04$ $P_{unc}=0.02$ $P_{FDR}=0.08$

PCC, posterior cingulate cortex; LP, lateral parietal.

Change in DMN

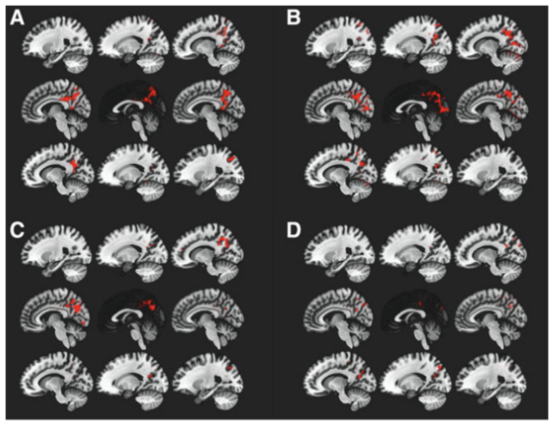


FIG. 5. Default-mode network activity in the PBM group—**(A)** baseline and **(B)** week 12 and in the usual care group—**(C)** baseline and **(D)** week 12. The posterior cingulate cortex (1, −61, and 38) was used as seed in the analysis; Height threshold: $P_{unc} < 0.001$; cluster threshold $P_{FDR} < 0.05$.

Dementia case series

Photomed Laser Surg. 2017 Aug 1; 35(8): 432–441. PMCID: PMC5568598
Published online 2017 Aug 1. doi: 10.1089/pho.2016.4227 PMID: 28186867

Significant Improvement in Cognition in Mild to Moderately Severe Dementia Cases Treated with Transcranial Plus Intranasal Photobiomodulation: Case Series Report

Anita E. Saltmarche, RN, MHSc,[✉1] Margaret A. Naeser, PhD,[2,3] Kai Fai Ho, PhD,[4] Michael R Hamblin, PhD,[5,6] and Lew Lim, PhD, DNM, MBA[7]

DEMOGRAPHICS AND BASELINE CHARACTERISTICS OF EACH PATIENT

Patient no.[a]	*Baseline MMSE*[b] *score*	*Baseline ADAS-cog score*	*Age at entry*	*Gender*	*Dementia diagnosis (years)*	*Diagnosis from physician*	*Years of education*	*Prescribed dementia medication*
1	10	58	77	Female	2	Dementia	7	No
2	10	58	90	Male	2	Dementia	10+ apprentice	Donepezil
3	21	26.33	76	Male	0.5	Dementia. Memory changes noted by wife 1 year earlier.	16	No
4	22	20.67	72	Male	3.5	Dementia. Very gradual decline, works part-time.	10	Donepezil
5	24	14.33	73	Male	8	Dementia. Diagnosis by one physician, AD. Failed re-registration exam.	18	Donepezil
Mean (SD)	17.4 (6.84)	35.47 (21.00)	77.6 (7.23)		3.2 (2.89)		12.2 (4.6)	

MMSE changes

Case reviews

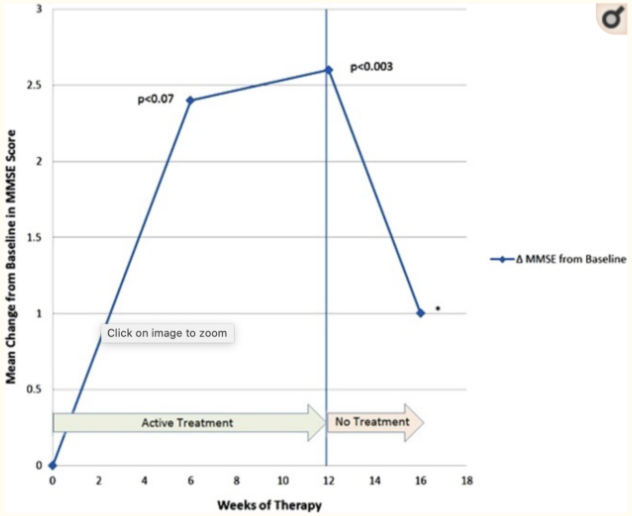
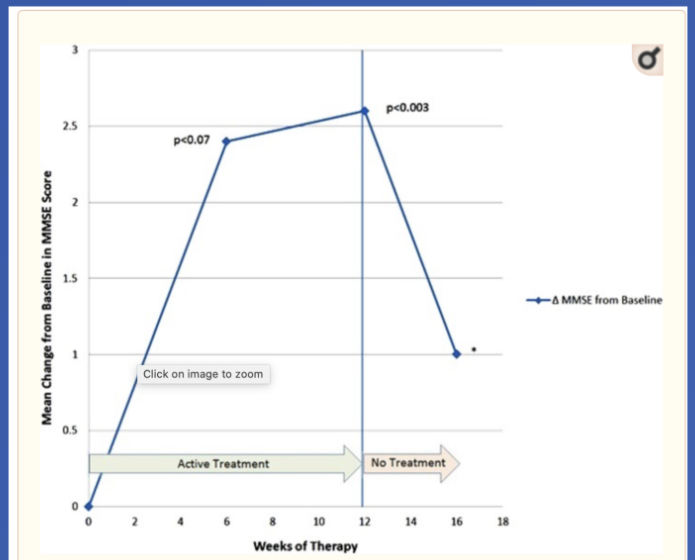


FIG. 2.

Mean change from baseline in MMSE scores. Higher numbers indicate better cognition on this test. *The *p* value for week 16 is omitted due to missing data from a patient who dropped out during the "4-Week, No-Treatment Period." MMSE, Mini-Mental State Exam.

RESULTS OF MINI-MENTAL STATE EXAM AND ALZHEIMER'S DISEASE ASSESSMENT SCALE-COGNITIVE SUBSCALE SCORES FOR EACH CASE AND MEAN CHANGES FROM BASELINE

	Baseline		*Week 6*		*Week 12*		*4-Week, no treatment*	
Patient no.	***MMSE***	***ADAS-cog***	***MMSE***	***ADAS-cog***	***MMSE***	***ADAS-cog***	***MMSE***	***ADAS-cog***
1	10	58	11	52	13	50	11	52
2	10	58	13	46	12	48.67	Dropped out[a]	Dropped out[a]
3	21	26.33	27	9.33	23	16.66	20	22
4	22	20.67	23	15.66	24	13.33	24	14
5	24	14.33	25	17.34	28	15	25	12.33
Mean (SD)	17.40 (6.84)	35.47 (21.00)	19.80 (7.29)	28.07 (19.46)	20.00 (7.11)	28.73 (18.85)	20.25 (6.60)[b]	25.08 (18.44)[b]
Mean change from baseline	0	0	2.40	−7.40	2.60	−6.73	1.00[b]	−4.75[b]
p Value of mean change			<0.07	<0.09	<0.003	<0.023	[c]	[c]



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4	22	20.67	72	Male	3.5	Dementia. Very gradual decline, works part-time.	10	Donepezil
5	24	14.33	73	Male	8	Dementia. Diagnosis by one physician, AD. Failed re-registration exam.	18	Donepezil
Mean (SD)	17.4 (6.84)	35.47 (21.00)	77.6 (7.23)		3.2 (2.89)		12.2 (4.6)	

MMSE changes

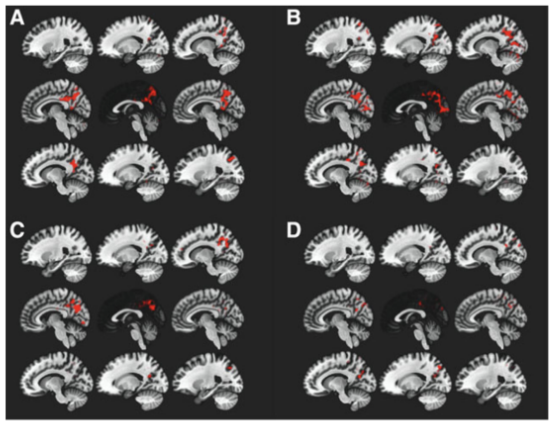


FIG. 5. Default-mode network activity in the PBM group—**(A)** baseline and **(B)** week 12 and in the usual care group—**(C)** baseline and **(D)** week 12. The posterior cingulate cortex (1, −61, and 38) was used as seed in the analysis; Height threshold: $P_{unc} < 0.001$; cluster threshold $P_{FDR} < 0.05$.

Dementia case series

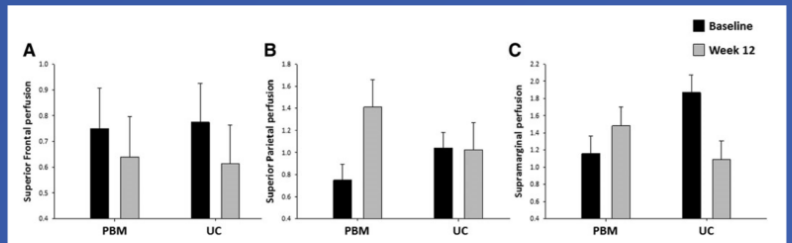


FIG. 4. Arterial spin-labeled perfusion values, normalized to the precentral ROI, from the superior frontal **(A)**, superior parietal **(B)**, and supramarginal **(C)** ROIs at baseline (black bar) and week 12 (gray bar) by group. Error bars are SEM.

TABLE 4. STRENGTH OF CONNECTIVITY BETWEEN THE POSTERIOR CINGULATE CORTEX (SEED) AND LATERAL PARIETAL CORTEX BY GROUP AND TIME

	PBM		*UC*	
	Baseline	*Week 12*	*Baseline*	*Week 12*
PCC–left LP	$T(3) = 4.25$ $P_{unc} = 0.02$ $P_{FDR} = 0.07$	$T(3) = 14.15$ $P_{unc} = 0.0008$ $P_{FDR} = 0.004$	$T(3) = 6.88$ $P_{unc} = 0.006$ $P_{FDR} = 0.02$	$T(3) = 3.86$ $P_{unc} = 0.03$ $P_{FDR} = 0.08$
PCC–right LP	$T(3) = 3.98$ $P_{unc} = 0.03$ $P_{FDR} = 0.07$	$T(3) = 11.17$ $P_{unc} = 0.002$ $P_{FDR} = 0.004$	$T(3) = 8.34$ $P_{unc} = 0.004$ $P_{FDR} = 0.02$	$T(3) = 5.04$ $P_{unc} = 0.02$ $P_{FDR} = 0.08$

PCC, posterior cingulate cortex; LP, lateral parietal.

Change in DMN

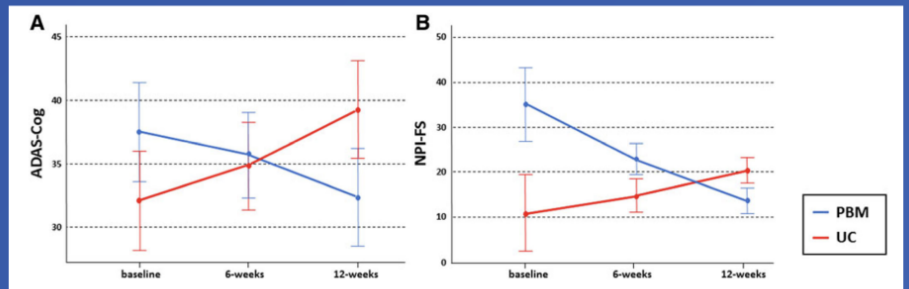


FIG. 3. Mean (±SEM) ADAS-cog **(A)** and NPI-FS **(B)** scores in the PBM (blue line) and Usual Care (red line) groups by time. Lower scores on both measures indicate better function. ADAS-cog, Alzheimer's Disease Assessment Scale-cognitive; NPI-FS, Neuropsychiatric Inventory frequency severity; SEM, standard error of the mean; PBM, photobiomodulation.

Neuroimaging

Photobiomodulation, Photomedicine, and Laser Surgery
Volume XX, Number XX, 2019
© Mary Ann Liebert, Inc.
Pp. 1–9
DOI: 10.1089/photob.2018.4555

Original Research

Effects of Home Photobiomodulation Treatments on Cognitive and Behavioral Function, Cerebral Perfusion, and Resting-State Functional Connectivity in Patients with Dementia: A Pilot Trial

Linda L. Chao, PhD[1–3]

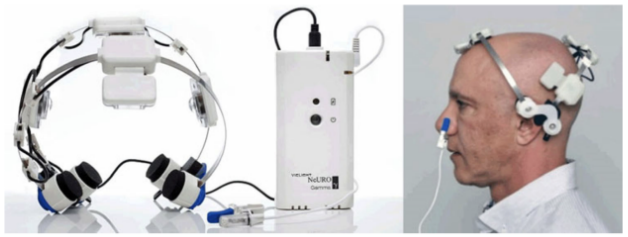


FIG. 1. Vielight Neuro Gamma device (left) and photograph illustrating positions of the device LEDs during treatment (right). Figure courtesy of Vielight, Inc. LED, light emitting diode.

FIG. 2. Approximate position of the Vielight Neuro Gamma transcranial LEDs on the FreeSurfer ROIs. The precentral ROI was used as a control region in analysis of the perfusion data. ROI, regions of interest.

Symptom changes

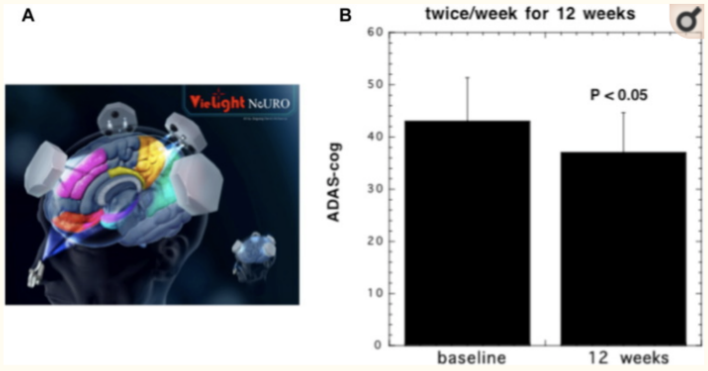
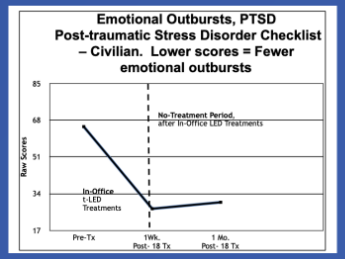
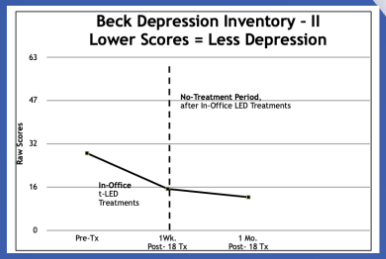


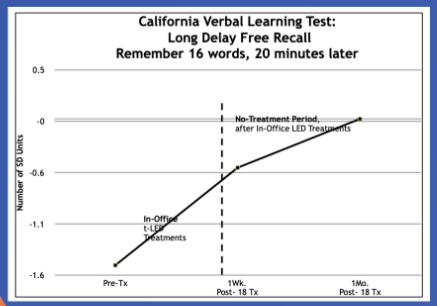
Fig. 5

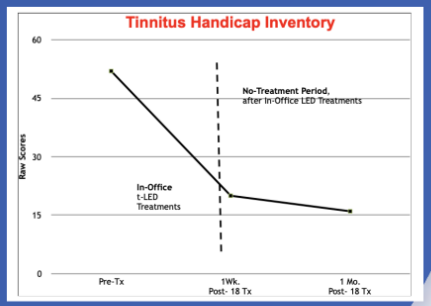
tPBM for Alzheimer's disease. (A) Nineteen patients were randomized to receive real or sham tPBM (810 nm LED, 24.6 J/cm^2 at 41 mW/cm^2). (B) Significant decline in ADAS-cog (improved cognitive performance) in real but not sham (unpublished data).

Small Pilot Study


Emotional Outbursts, PTSD
Post-traumatic Stress Disorder Checklist – Civilian. Lower scores = Fewer emotional outbursts
Raw Scores
85
68
51
34
17
No-Treatment Period, after In-Office LED Treatments
In-Office t-LED Treatments
Pre-Tx
1Wk. Post- 18 Tx
1 Mo. Post- 18 Tx


Beck Depression Inventory - II
Lower Scores = Less Depression
Raw Scores
63
47
32
16
0
No-Treatment Period, after In-Office LED Treatments
In-Office t-LED Treatments
Pre-Tx
1Wk. Post- 18 Tx
1 Mo. Post- 18 Tx

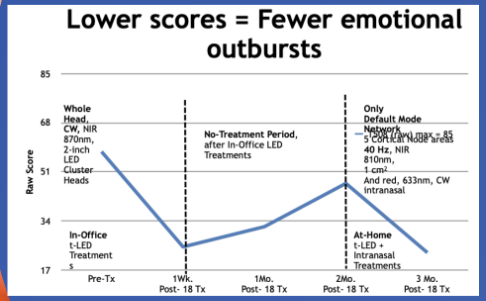

California Verbal Learning Test:
Long Delay Free Recall
Remember 16 words, 20 minutes later
Number of SD Units
0.5
-0
-0.6
-1.1
-1.6
No-Treatment Period, after In-Office LED Treatments
In-Office t-LED Treatments
Pre-Tx
1Wk. Post- 18 Tx
1Mo. Post- 18 Tx


Tinnitus Handicap Inventory
Raw Scores
60
45
30
15
0
No-Treatment Period, after In-Office LED Treatments
In-Office t-LED Treatments
Pre-Tx
1Wk. Post- 18 Tx
1 Mo. Post- 18 Tx

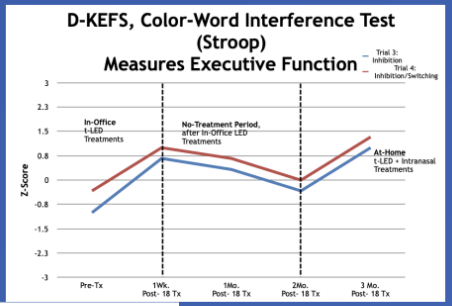
Dementia

Transcranial, Near-infrared Photobiomodulation to Improve Cognition in Two, Retired Professional Football Players Possibly Developing CTE
Poster, International Brain Injury Association (IBIA) Meeting, Toronto, March 2019
M.A. Naeser1,2, P.I. Martin1,2, M.D. Ho1, M.H. Krengel1,2,Y. Bogdanova1,3, J.A. Knight1, A.E. Fedoruk1, M.R. Hamblin4, B.B. Koo2

Lower scores = Fewer emotional outbursts



D-KEFS, Color-Word Interference Test (Stroop) Measures Executive Function

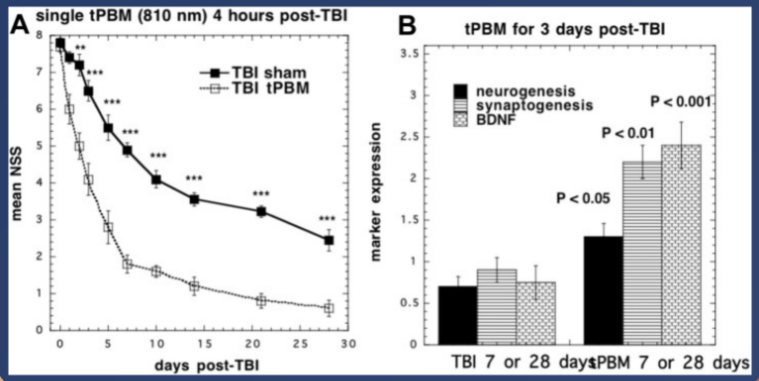


Case 2 CTE

Resting-state functional-connectivity MRI

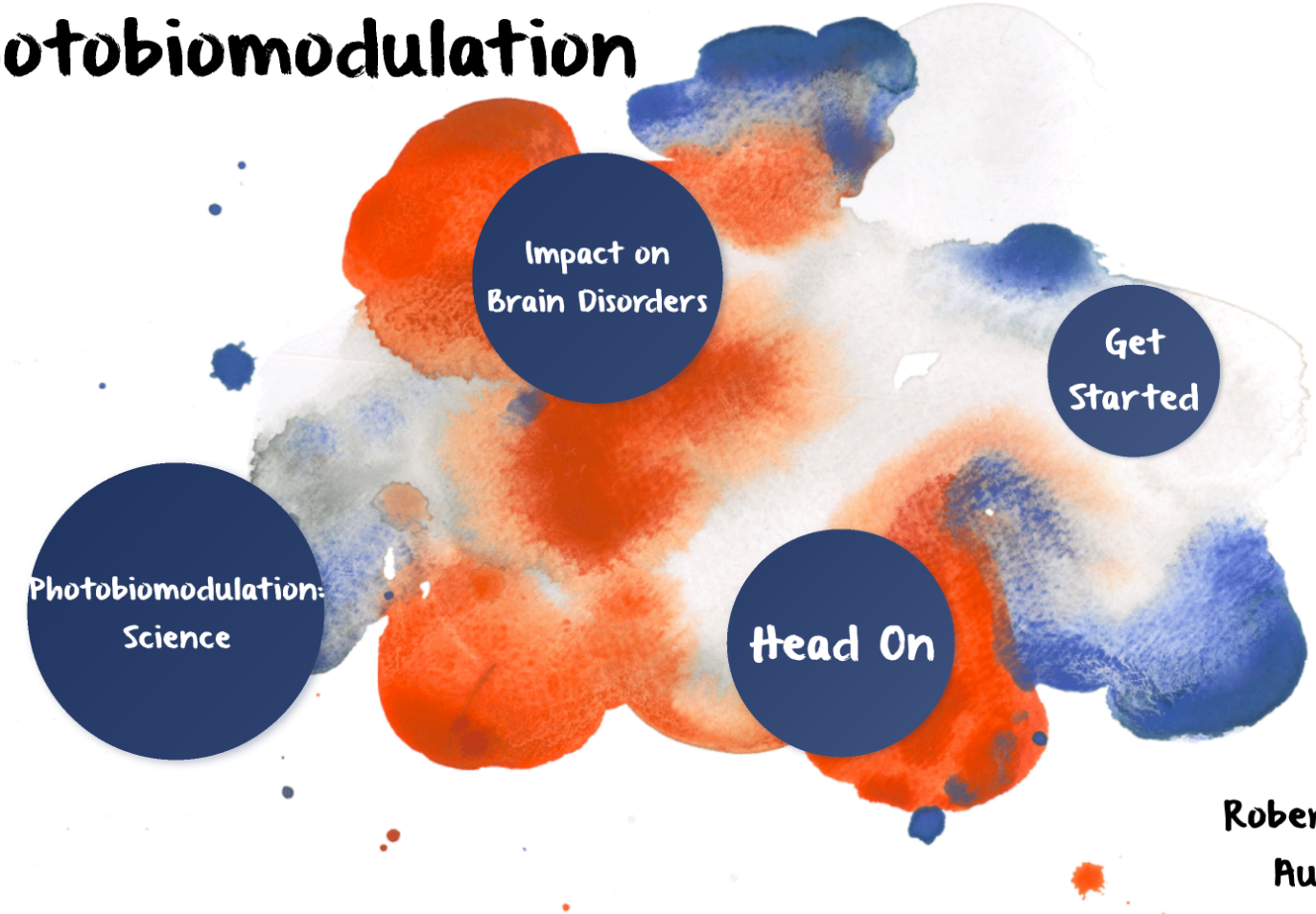
Before LED Tx.	1 wk After In-Office LED	1 mo After In-Office LED	3 mo After In-Office LED	After 3 mo In-Home LED
1127 (10)	1243 (11)	1693 (16)	1268 (12)	1443 (13)

Traumatic Brain Injury



CTE case studies

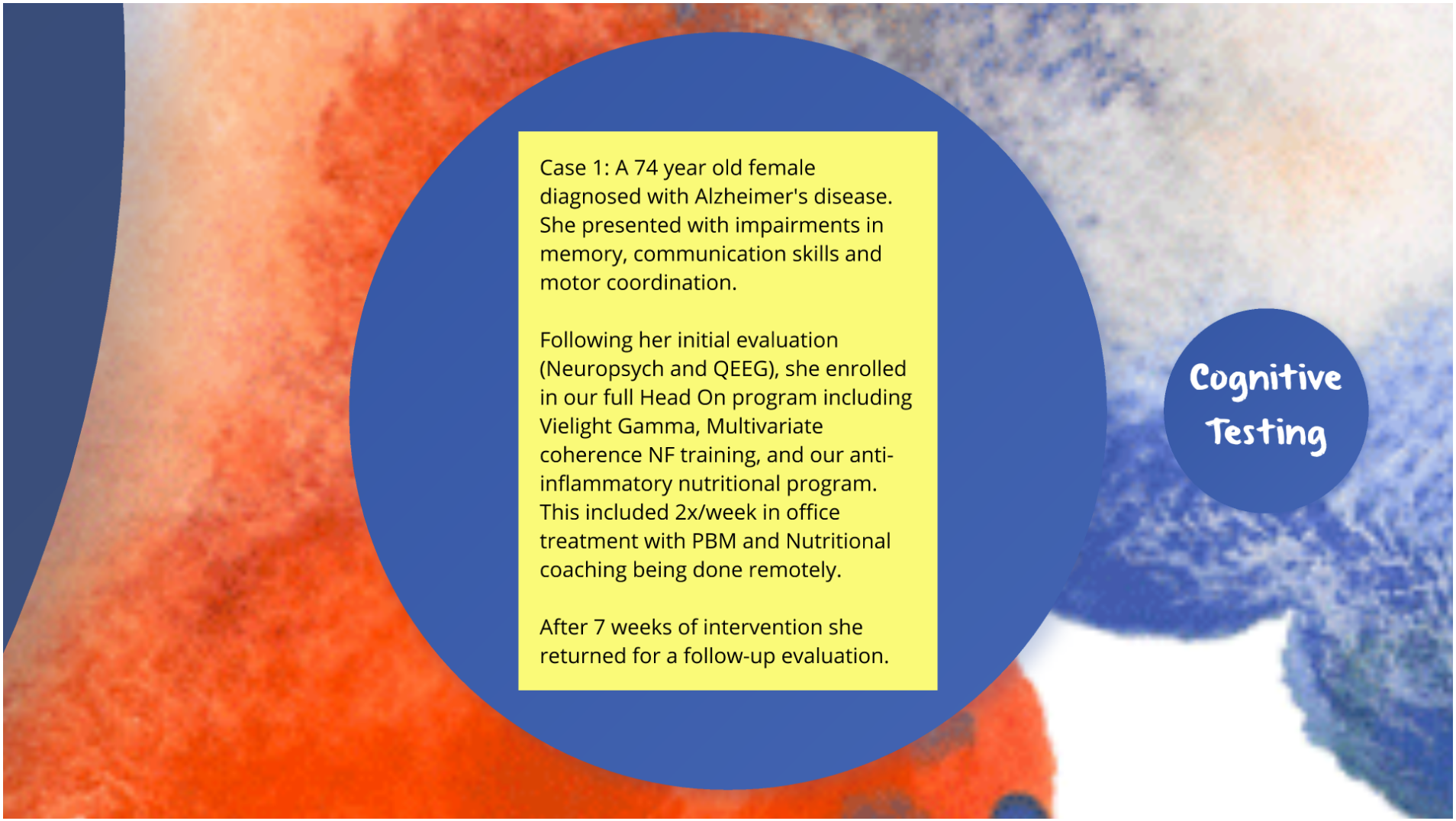
Photobiomodulation



Robert Coben, PhD

August 28, 2020


HEAD ON!
PROGRAM
Head On Program
Case Review



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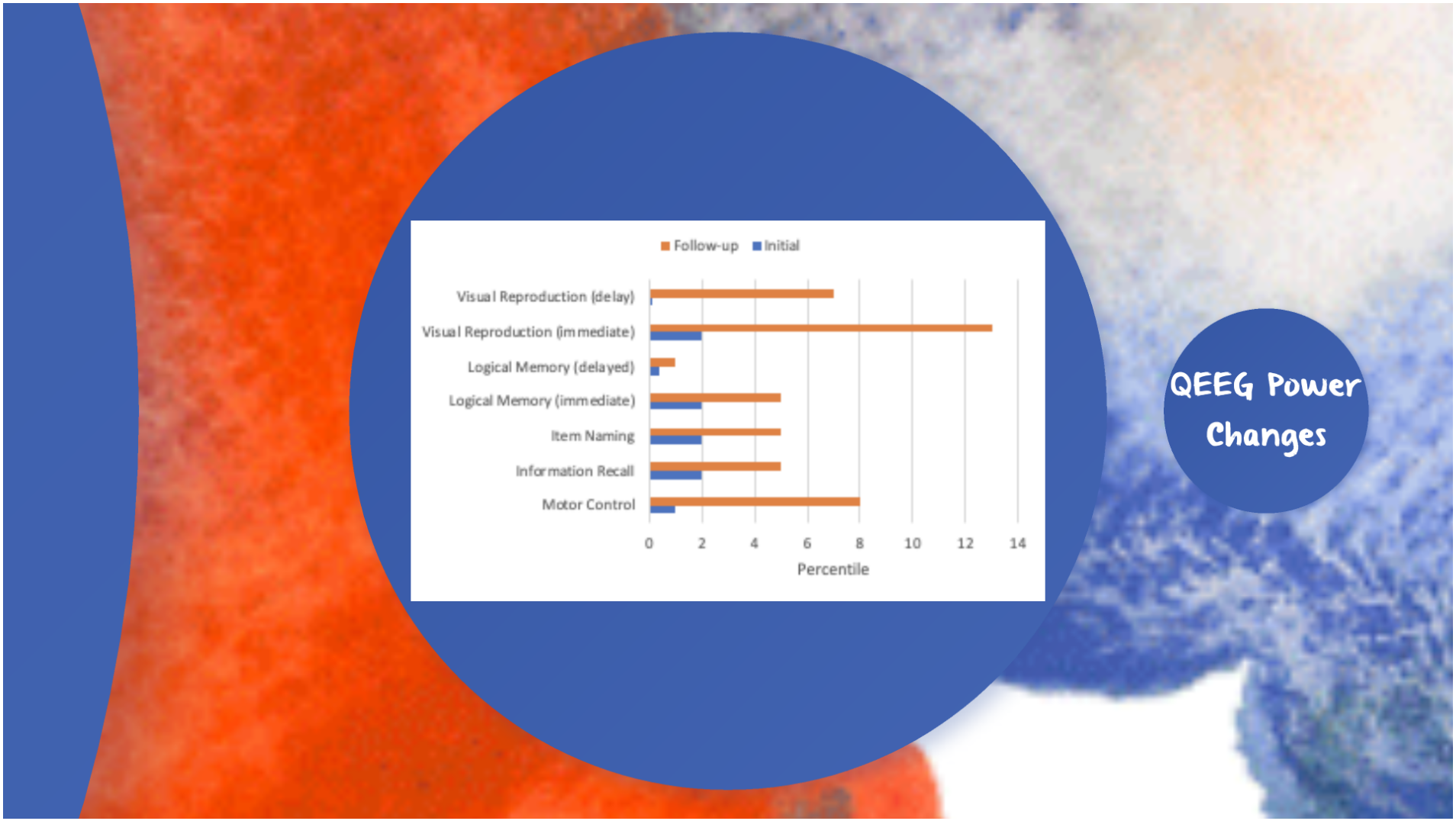
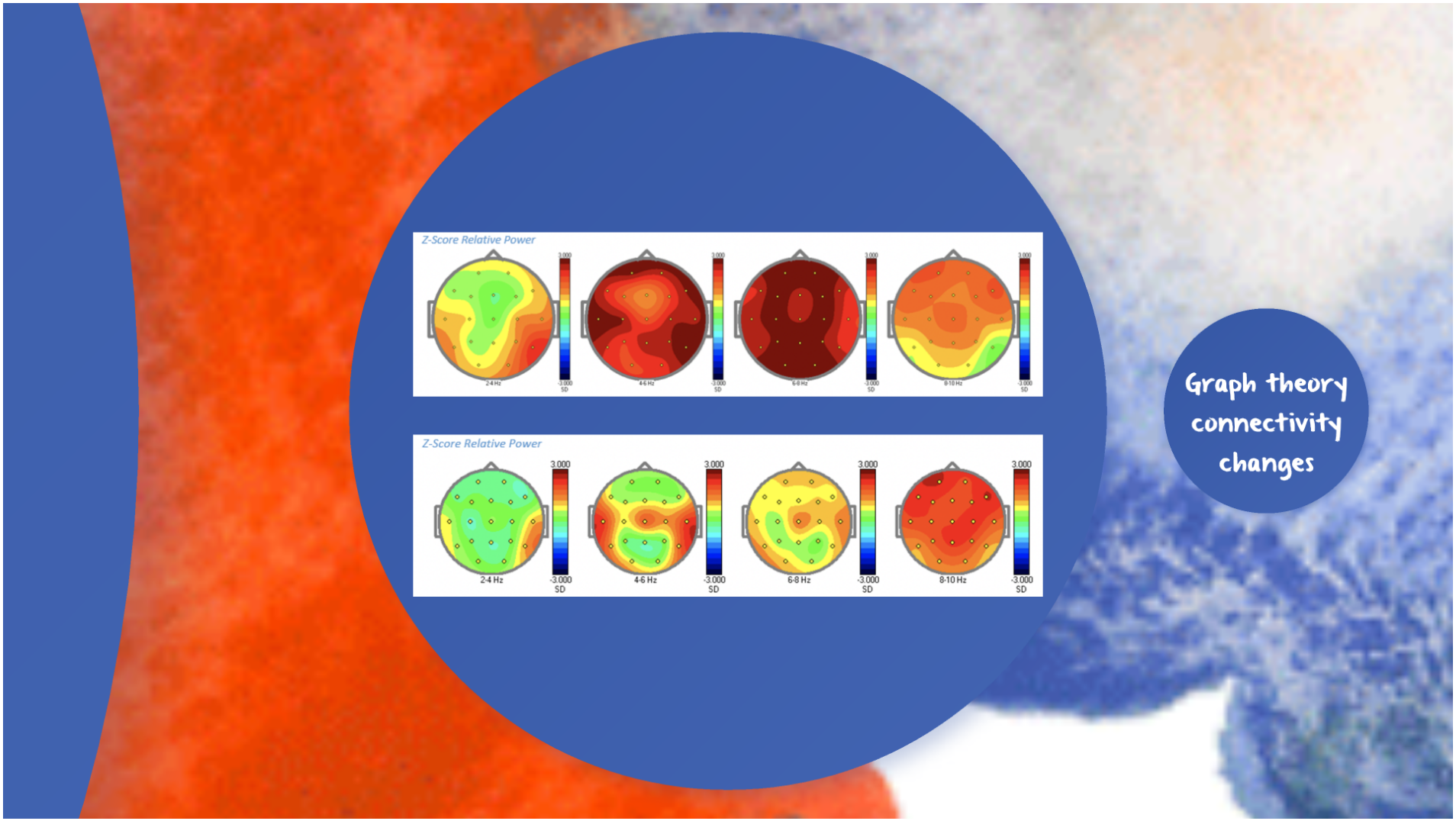
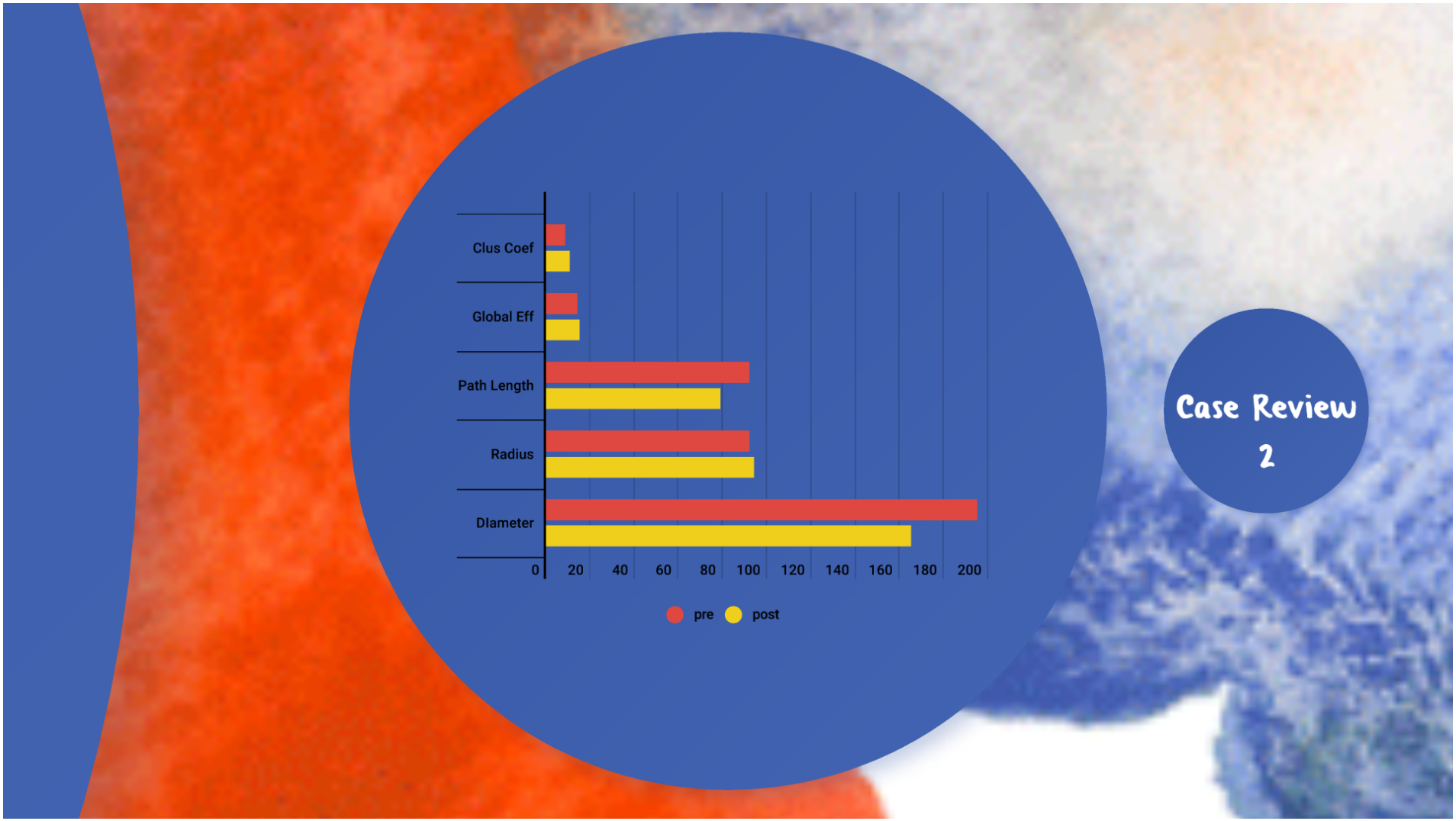
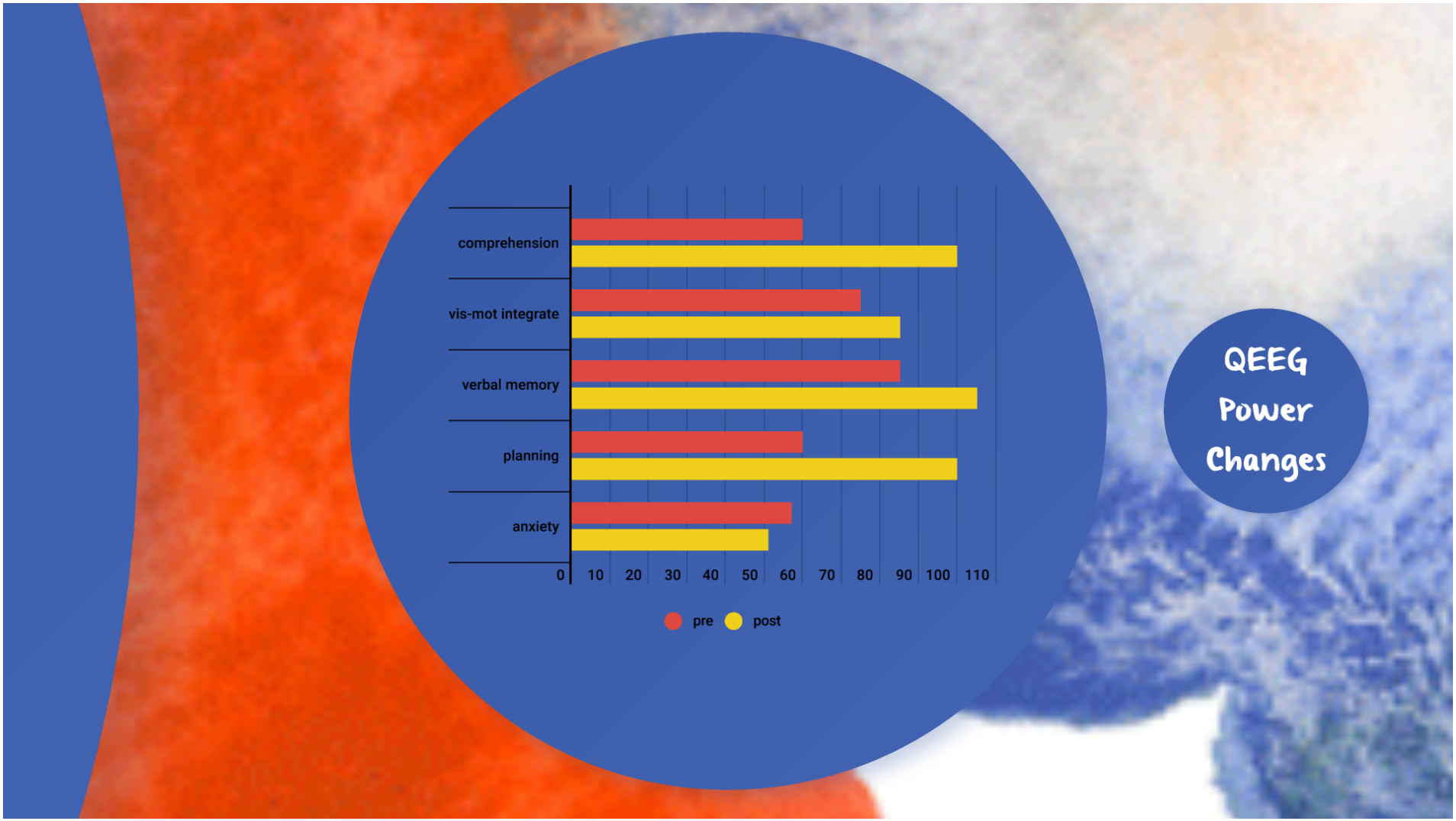
After 7 weeks of intervention she returned for a follow-up evaluation.

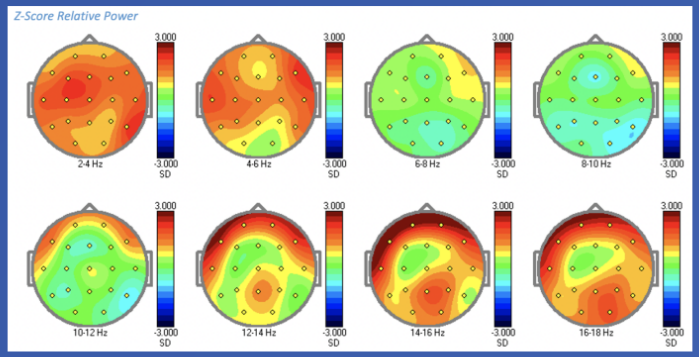

Follow-up
Initial
Visual Reproduction (delay)
Visual Reproduction (immediate)
Logical Memory (delayed)
Logical Memory (immediate)
Item Naming
Information Recall
Motor Control
0
2
4
6
8
10
12
14
Percentile
QEEG Power Changes

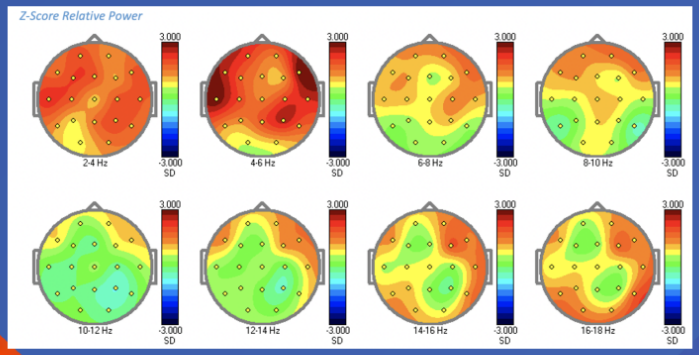

Z-Score Relative Power
3.000
-3.000
SD
2-4 Hz
4-6 Hz
6-8 Hz
8-10 Hz
Z-Score Relative Power
3.000
-3.000
SD
2-4 Hz
4-6 Hz
6-8 Hz
8-10 Hz
Graph theory connectivity changes


Clus Coef
Global Eff
Path Length
Radius
Diameter
0
20
40
60
80
100
120
140
160
180
200
pre
post
Case Review
2

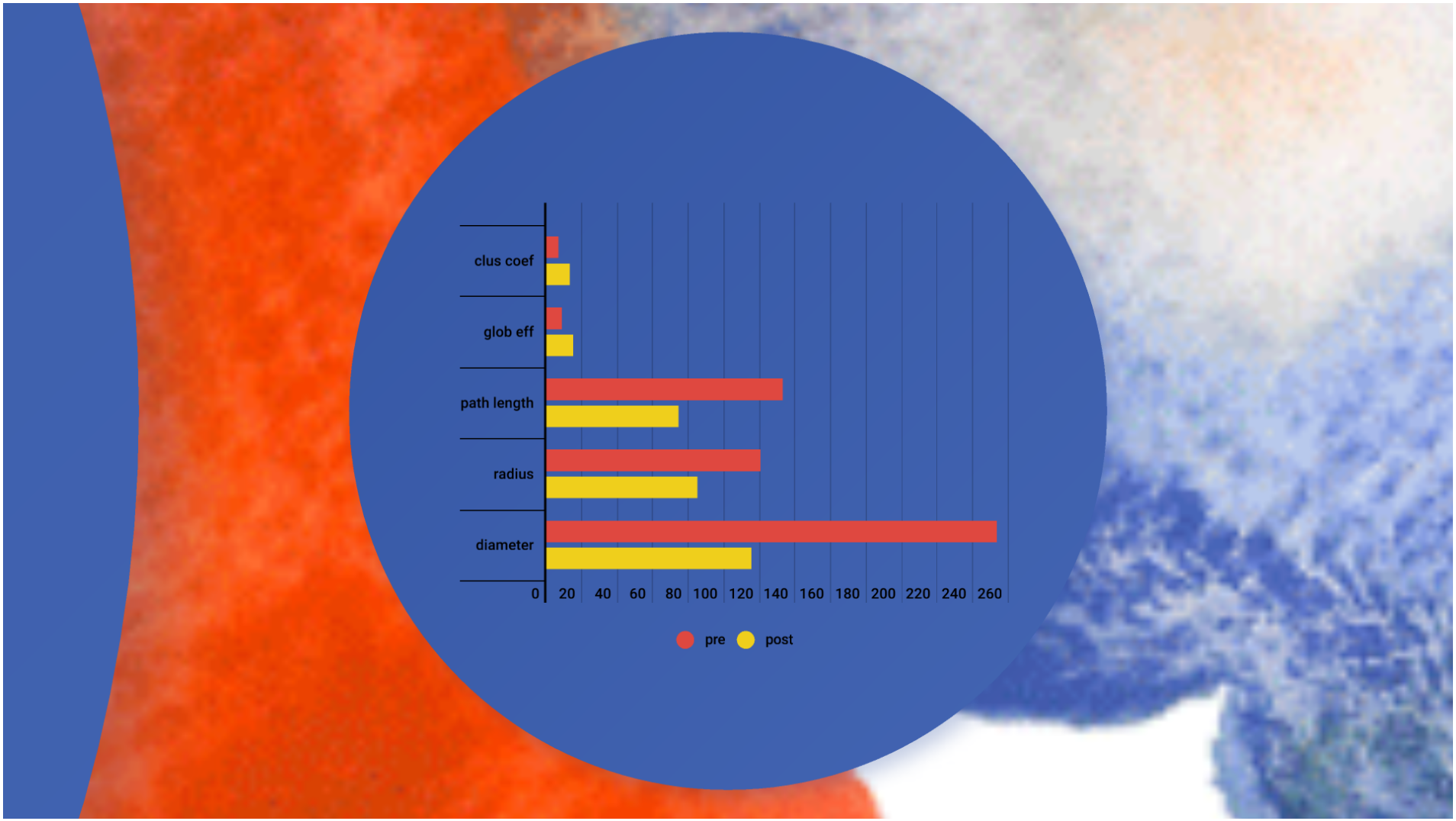

Patient 2 is a 71 year old female diagnosed with Mild Cognitive Impairment and Anxiety. She presented with memory and communication challenges.
She underwent an initial Neuropsychological evaluation and QEEG. She showed difficulties with comprehension, visual-motor integration, memory, and planning and problem solving abilities.
QEEG showed evidence of bilateral frontal. temporal and parietal excesses in delta, theta and beta frequencies.
Cognitive Testing


comprehension
vis-mot integrate
verbal memory
planning
anxiety
0
10
20
30
40
50
60
70
80
90
100
110
pre
post
QEEG
Power
Changes





Graph theory connectivity changes


clus coef
glob eff
path length
radius
diameter
0
20
40
60
80
100
120
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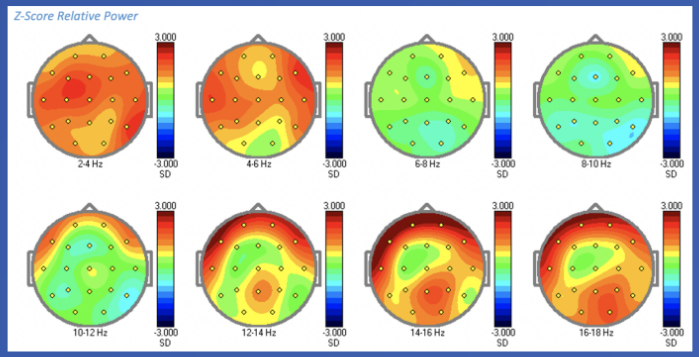
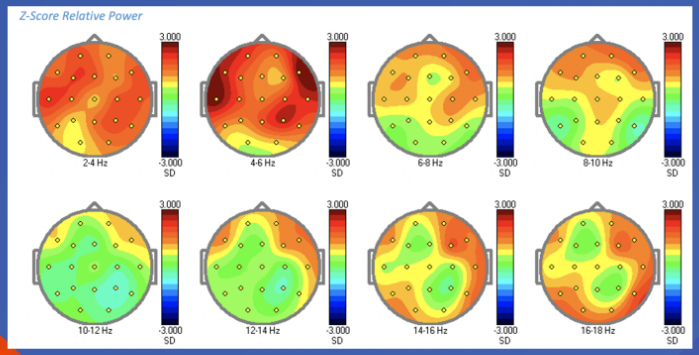
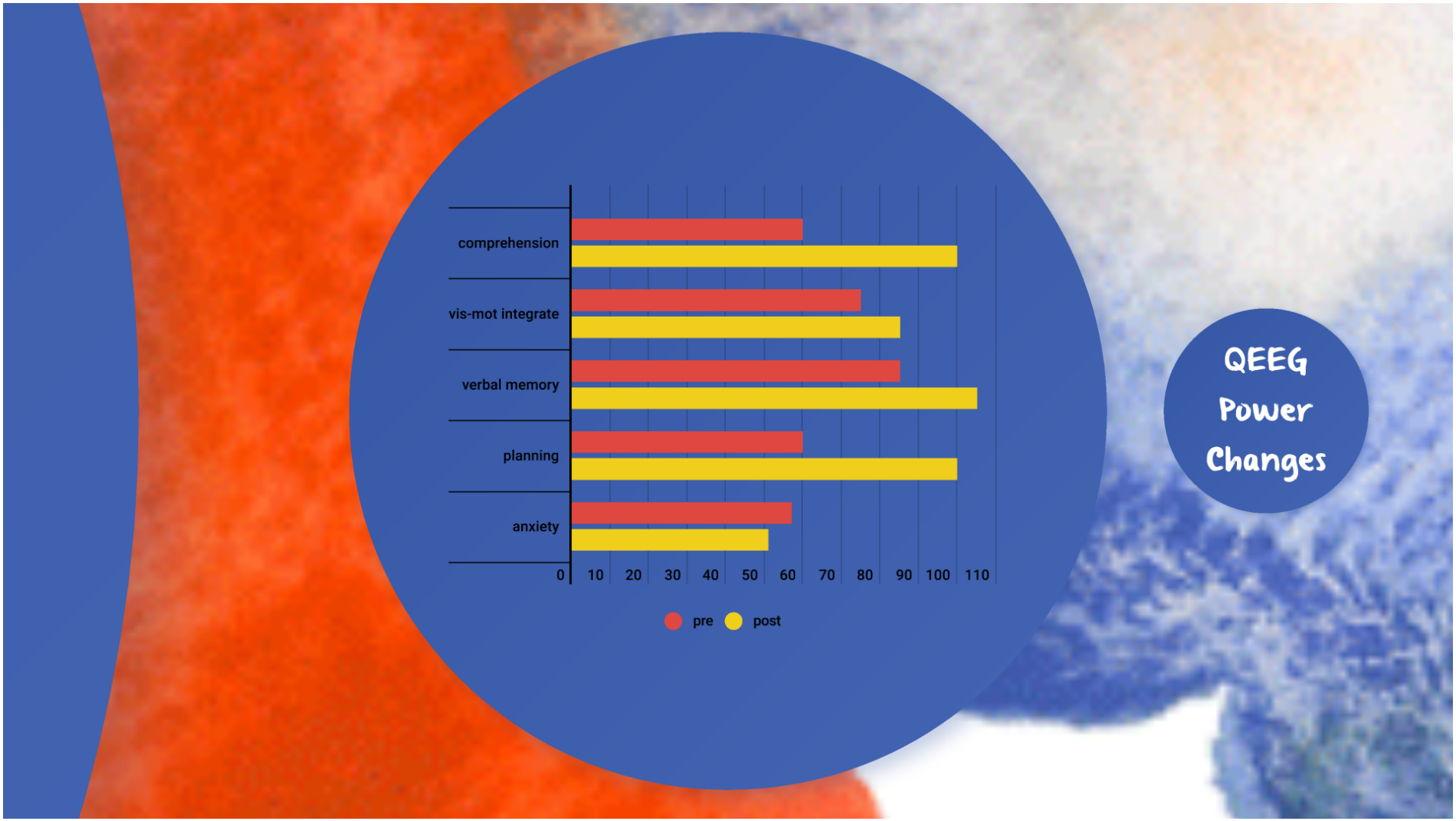
160
180
200
220
240
260
pre
post





Graph theory connectivity changes


comprehension
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QEEG
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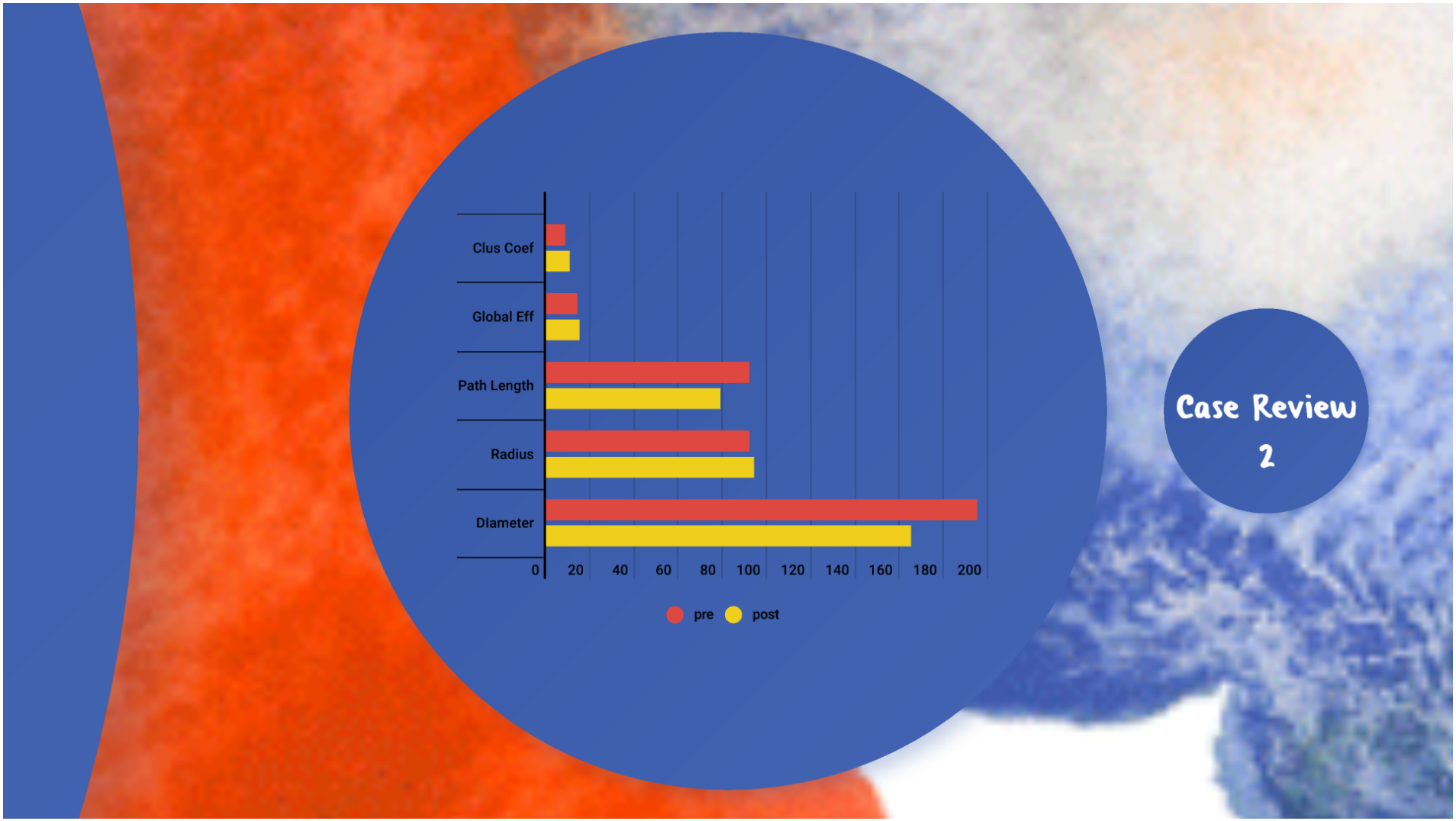
Clus Coef
Global Eff
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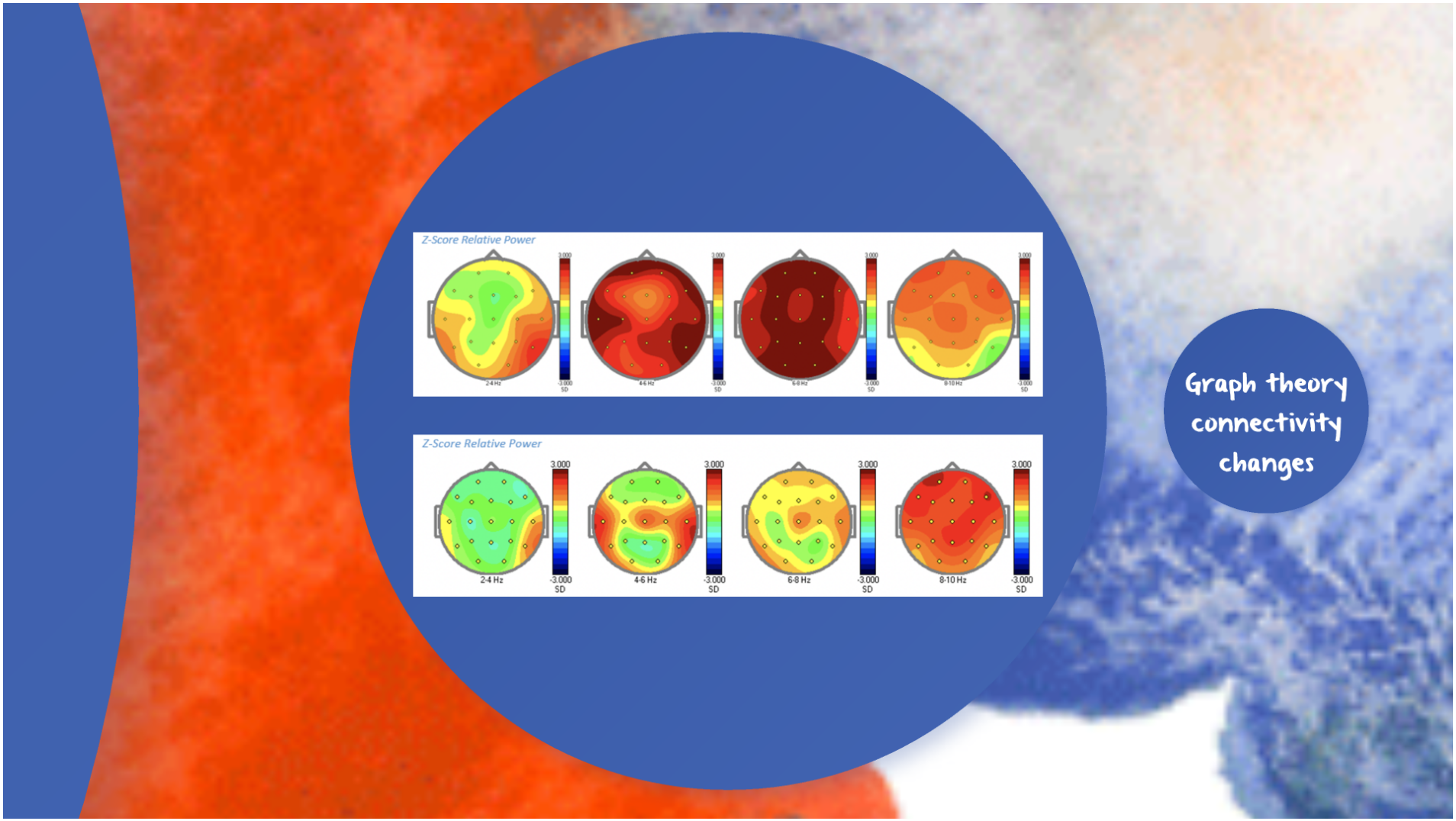
Case Review
2


Z-Score Relative Power
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6-8 Hz
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3.000
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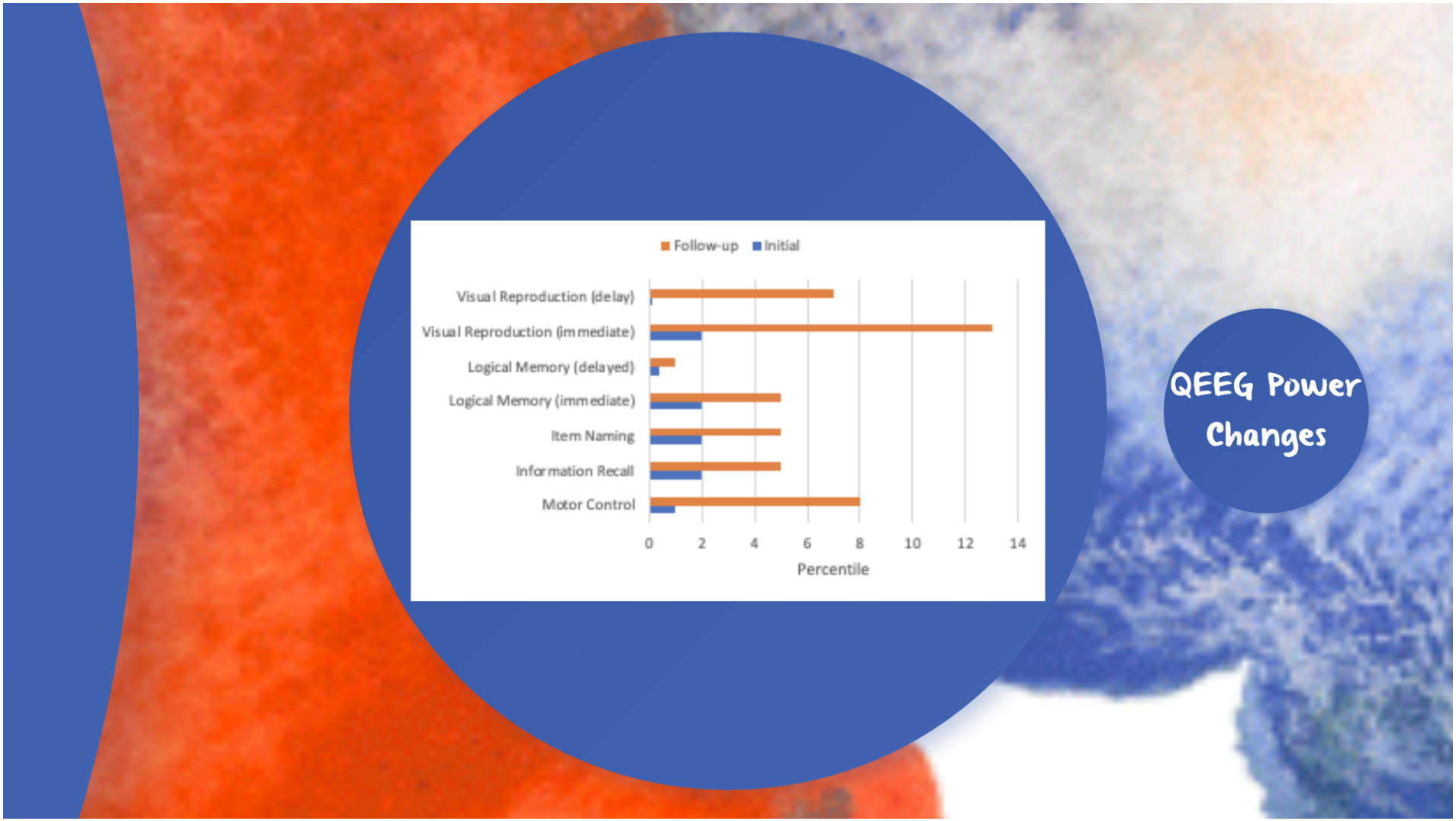
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Visual Reproduction (delay)
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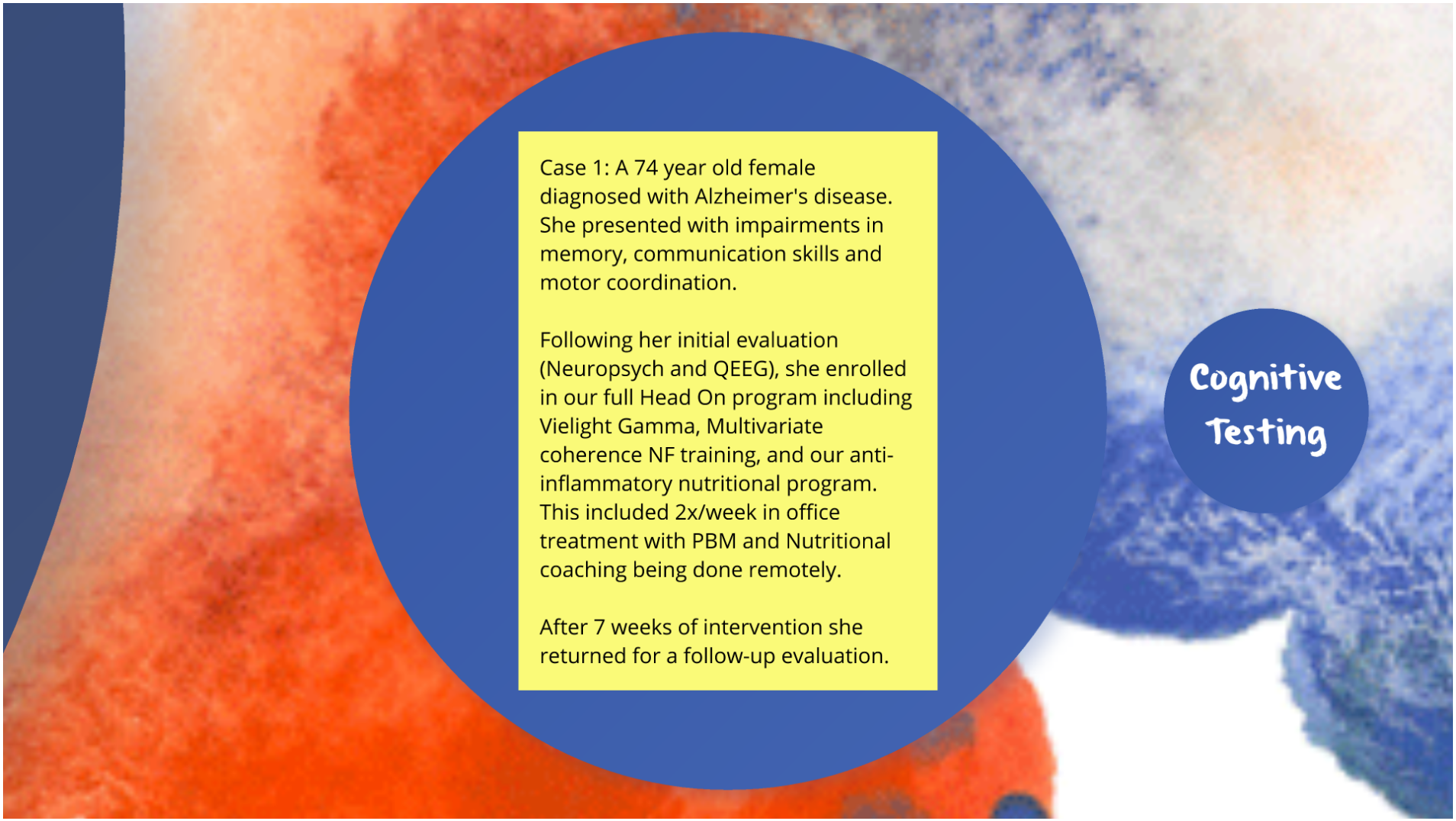
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Cognitive Testing


HEAD ON!
PROGRAM
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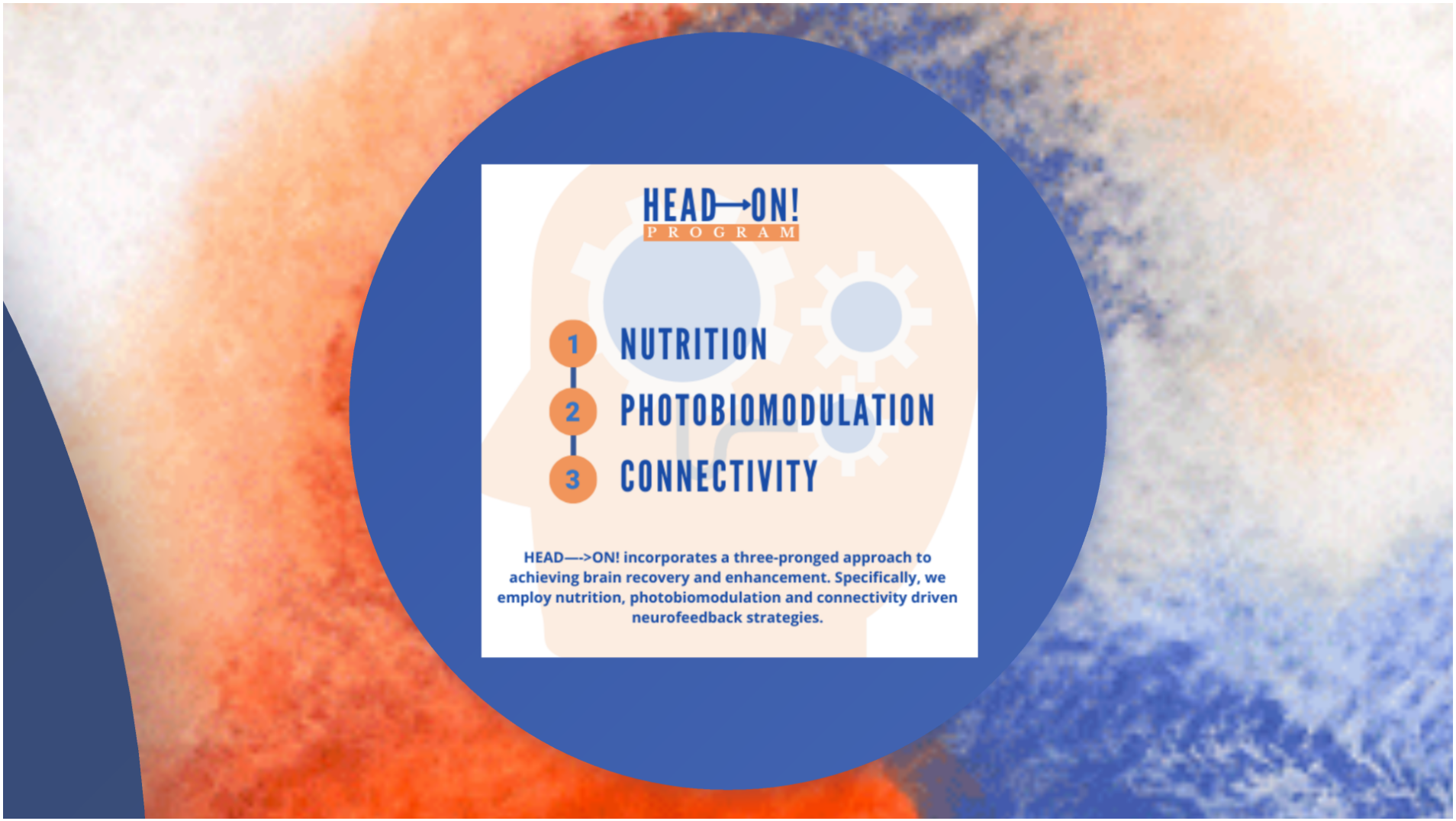
Case Review


HEAD—>ON!
PROGRAM
1 NUTRITION
2 PHOTOBIOMODULATION
3 CONNECTIVITY
HEAD—->ON! incorporates a three-pronged approach to achieving brain recovery and enhancement. Specifically, we employ nutrition, photobiomodulation and connectivity driven neurofeedback strategies.


HEAD ON!
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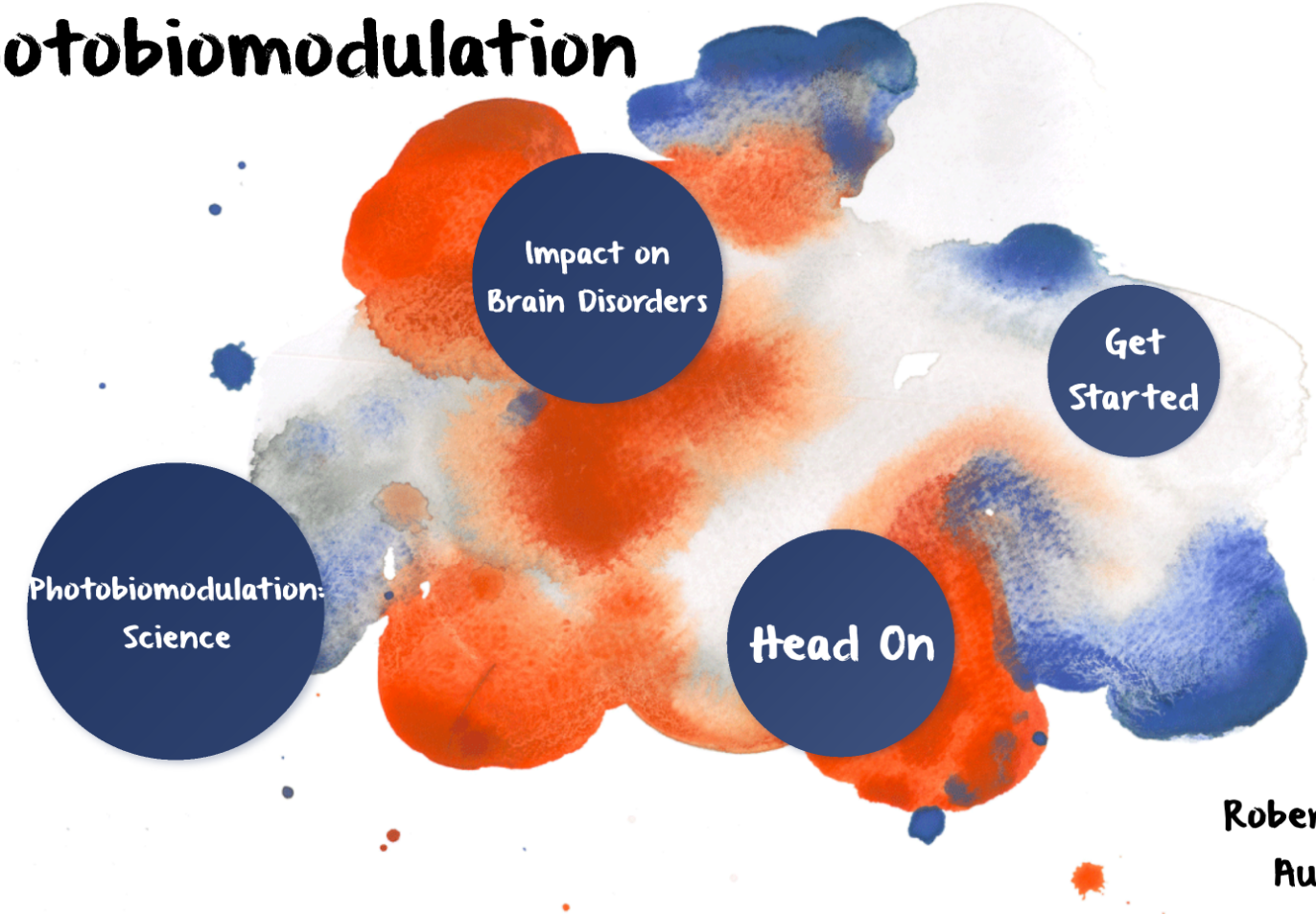
Photobiomodulation



Robert Coben, PhD

August 28, 2020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Candidates

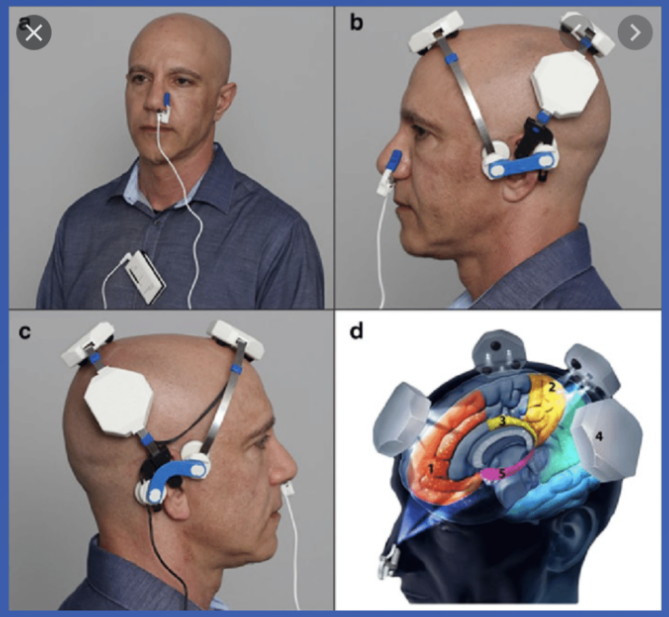

Who can benefit?
Adolescents to Older Adults
Concussion/Traumatic Brain Injury
Anyone with memory problems
Aging-related cognitive decline
Dementia's
Depression/Anxiety
Sleep impairment
Vielight

Setup

The Vielight Neuro Gamma is a powerful brain photobiomodulation (PBM) device. It is one of two next-generation near infrared (NIR) wearable devices, suitable for use at home.

The patented combination of transcranial and intranasal stimulation makes the Neuro Gamma ideal for comprehensive brain photobiomodulation, by simultaneously stimulating the ventral and cortical brain areas.

Positioning

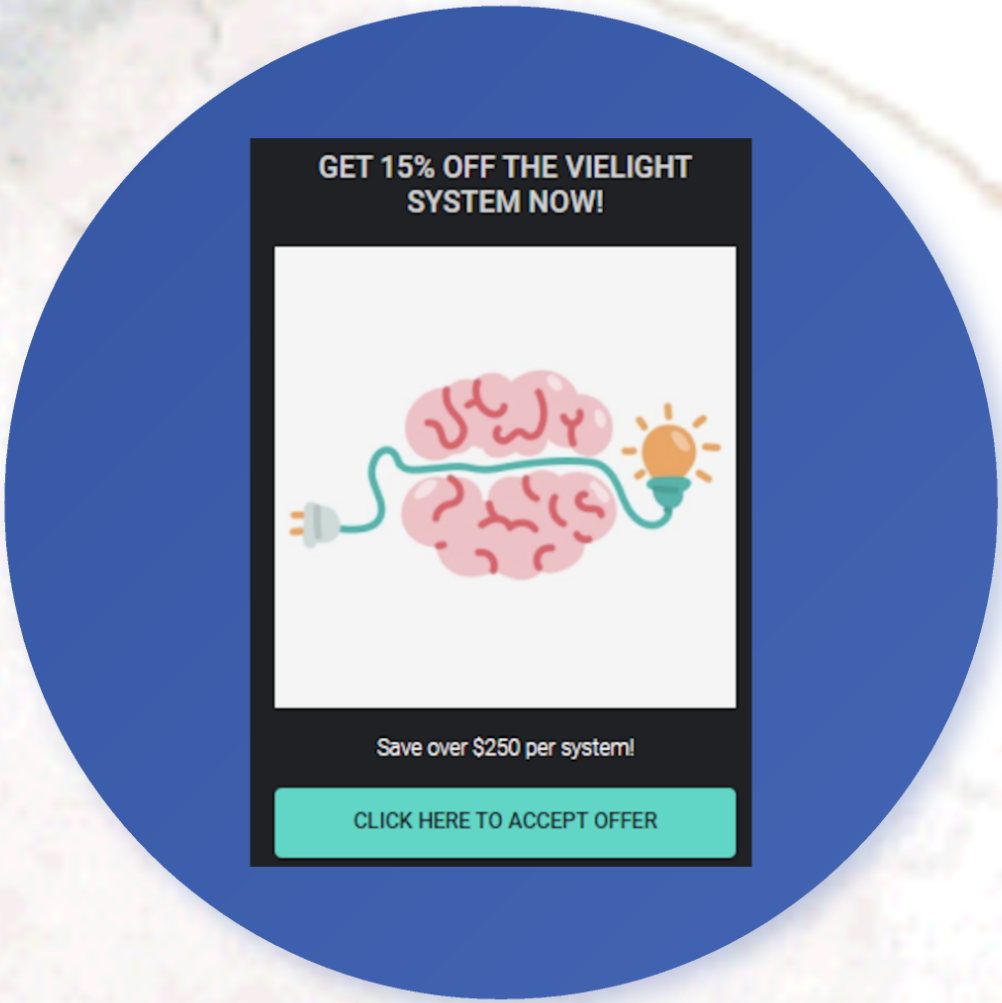


Coaching

Guidelines for Use

Home use vs office
Ship to their home or pickup at office
Initial training session
Make sure setup and charging are correct/complete
Use for 15-20 minutes daily or every other day
Monitor progress

Offer



Incentive Plan

VIELIGHT COMPENSATION PLAN

Your Commission From Your Client's

0-5 Units	6-10 Units	11-15 Units	16-20 Units	>20 Units
15%	20%	20%	20%	25%

Your Commission From Your Client's ***Client's***

0-5 Units	6-10 Units	11-15 Units	16-20 Units	>20 Units
8%	15%	15%	15%	15%

INTEGRATE BRAIN HEALTH

Thank you


Thanks for joining us!
Questions?
Visit us at: https://
www.integratebrainhealth.com
admin@integrated-neuro.com
(479) 225-3223

VIELIGHT COMPENSATION PLAN

Your Commission From Your Client's

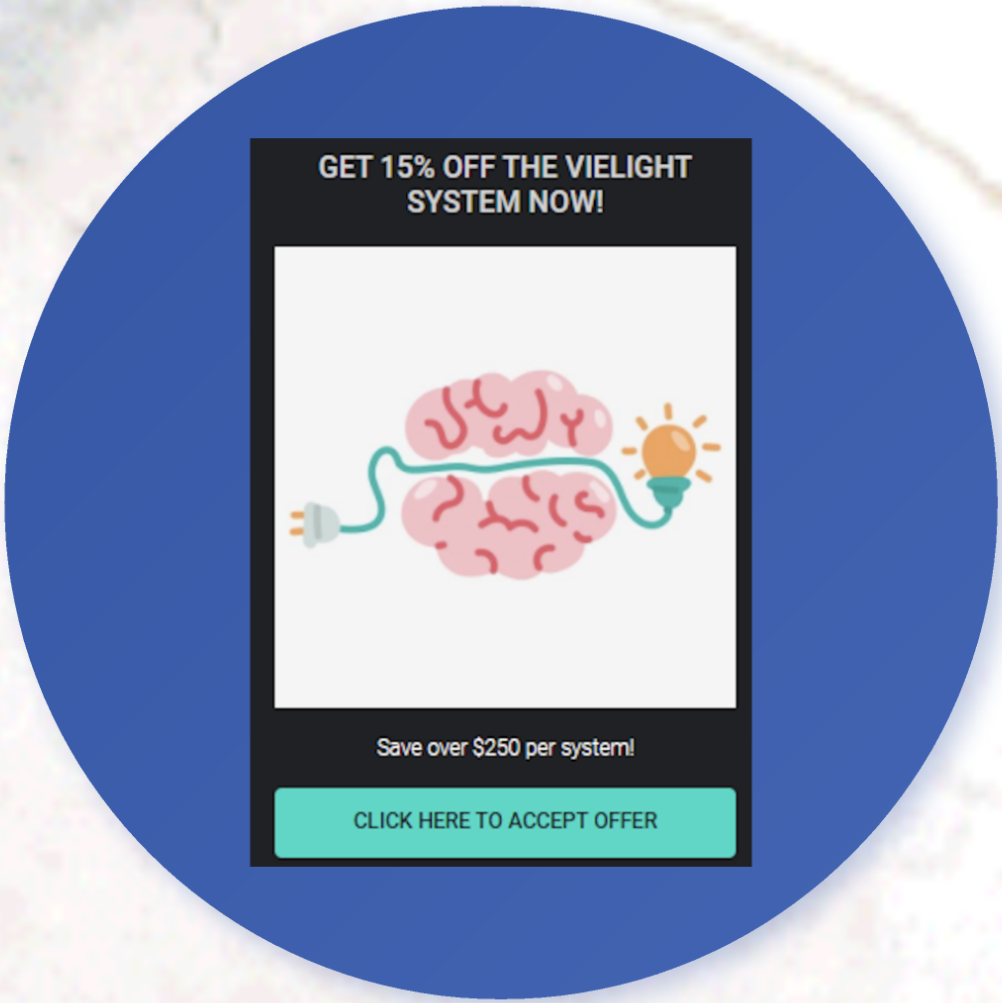
0-5 Units	6-10 Units	11-15 Units	16-20 Units	>20 Units
15%	20%	20%	20%	25%

Your Commission From Your Client's ***Client's***

0-5 Units	6-10 Units	11-15 Units	16-20 Units	>20 Units
8%	15%	15%	15%	15%

INTEGRATE BRAIN HEALTH

Thank you



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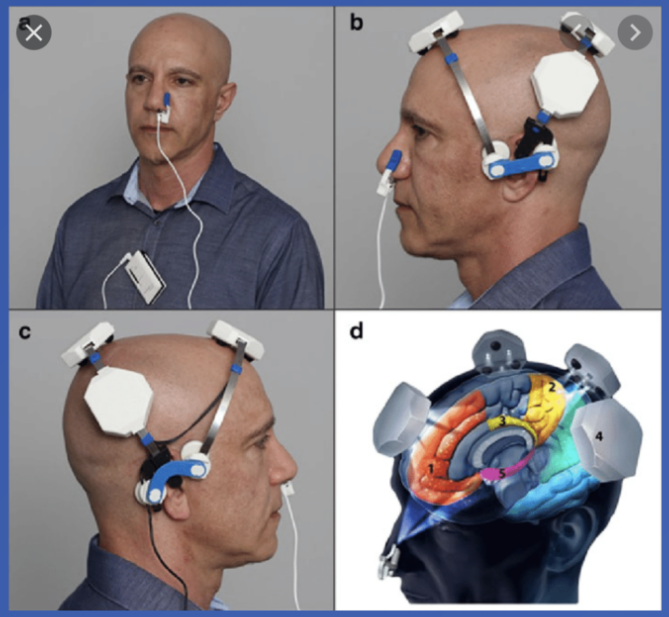

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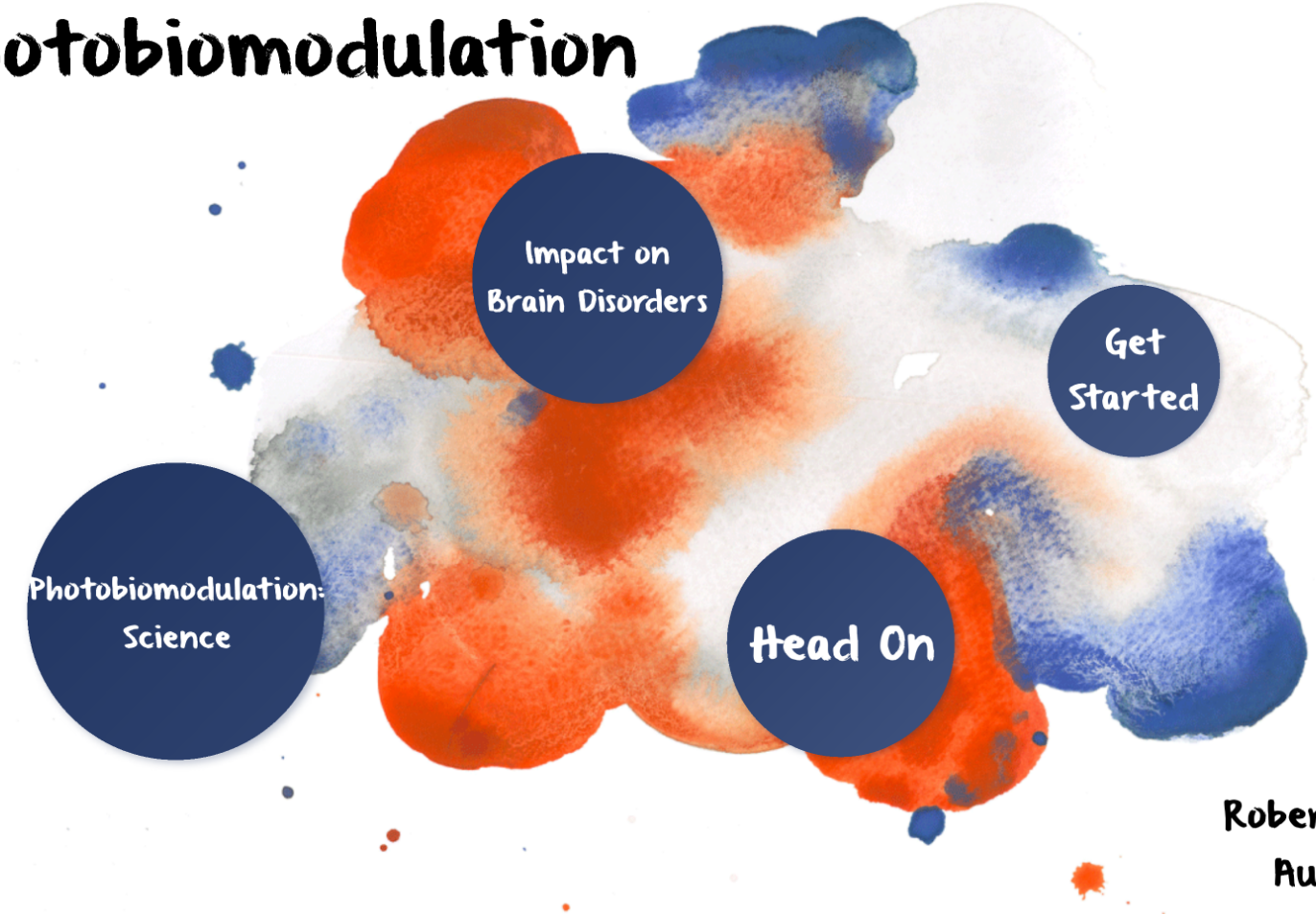
Candidates

Photobiomodulation



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