Robert S. Fox, O.D.
F.C.O.V.D., F.C.S.O.

INTRODUCTION TO BASIC SYNTONIC SYNDROMES

Disclosure

- I have no financial interest in any of the items, methods, or equipment mentioned in this lecture

College of Syntonic Optometry

A NONPROFIT CORPORATION DEDICATED TO RESEARCH IN PHOTORETINOLOGY, THE THERAPEUTIC APPLICATION OF LIGHT TO THE VISUAL SYSTEM

Rob Fox, OD, FCOVD, FCSO – President CSO

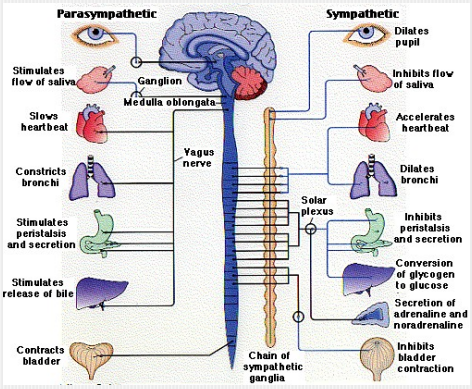
Basic Syntonic Syndromes

- Will cover 90-95% of cases
- What caused the stress?
- Treat the problem, not the symptom

The Autonomic Nervous System

Sympathetic and Parasympathetic

4



5

Sympathetic Actions

- Dilates the pupil
- Increases tearing
- Increases intraocular pressure
- Decreases accommodation
- Turns eye outward

6

Sympathetic Actions

- Decreases mucus, saliva and digestion
- Decreases arterial dilation
- Increases pulse rate
- Increases blood pressure
- Increases blood sugar

7

Sympathetic Activation

- Thyroid
- Adrenal Medulla
- Pituitary
- Gonads
- Muscles

8

Post-Traumatic Vision Syndrome

- Exophoria/exotropia
- Reduced accommodation
- Reduced convergence
- Poor blink rate / poor tearing
- Photophobia

9

Parasympathetic Actions

- Pupil constriction
- Decreases tearing
- Decreases intraocular pressure
- Increases accommodation
- Turns eye inward

10

Parasympathetic Actions

- Increases mucus, saliva and digestion
- Decreases pulse rate
- Increases arterial dilation
- Decreases blood pressure
- Decreases blood sugar

11

Parasympathetic Activation

- Parathyroids
- Adrenal cortex
- Digestive tract
- Liver
- Pancreas
- Spleen

12

Light Action on the Visual System

- Light Pathways
- Effect on Autonomic Nervous System
- Frequencies of light and how they affect the visual system

13

Light Pathways

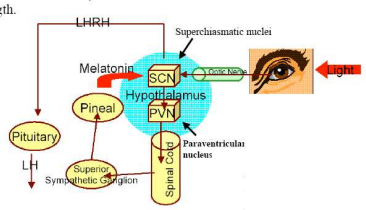
- Nonvisual photoreceptors of the deep brain, pineal gland and retina
- Hypothalamus: suprachiasmatic nucleus>pituitary
- Pituitary: ACTH to adrenal gland
- >cortisol/stress hormone
- Pineal: melatonin production
- Retina: influences suprachiasmatic nucleus
- **Intrinsically photosensitive retinal ganglion cells**

14

- **Intrinsically photosensitive Retinal Ganglion Cells**(ipRGCs), also called **photosensitive Retinal Ganglion Cells** (pRGC), or **melanopsin-containing retinal ganglion cells**, are a type of neuron (nerve cell) in the retina of the mammalian eye. While responses to light in mice lacking rods and cone cells were first noted in 1923,[1] they were forgotten, then rediscovered in the early 1990s.[2] The source of these responses was shown to be a special type of retinal ganglion cell, which, unlike other retinal ganglion cells, is intrinsically photosensitive. This means that they are a third class of retinal photoreceptors, excited by light even when all influences from classical photoreceptors (rods and cones) are blocked (either by applying pharmacological agents or by dissociating the ganglion cell from the retina). Photosensitive ganglion cells contain the photopigment melanopsin. The giant retinal ganglion cells of the primate retina are examples of photosensitive ganglion cells.

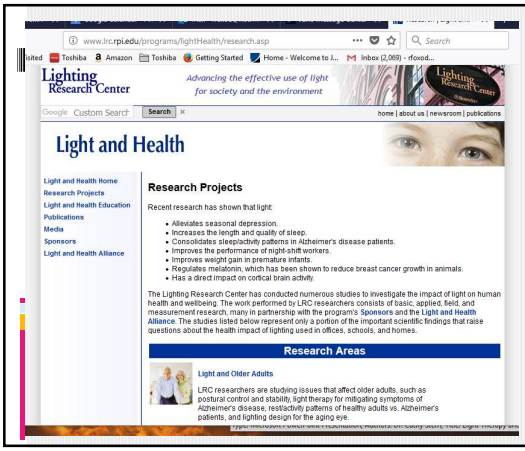
15

The pineal gland secretes melatonin and is a representation of day length.



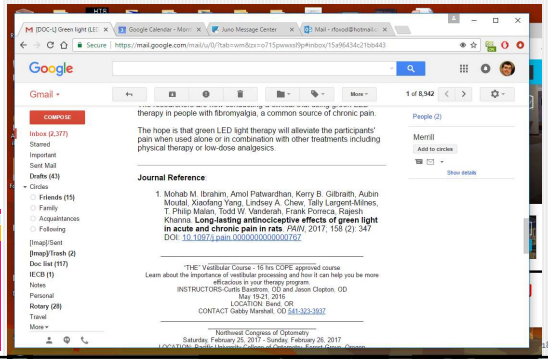
High [melatonin] = short day length
Low [melatonin] = long day length

16

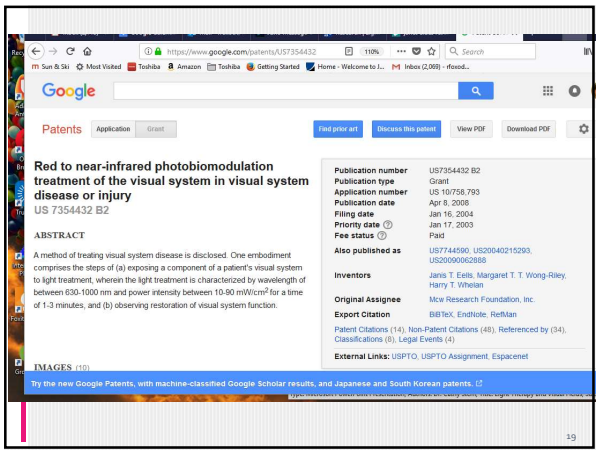


17

Current Research



18



Google Patents

Red to near-infrared photobiomodulation treatment of the visual system in visual system disease or injury

US 7354432 B2

ABSTRACT

A method of treating visual system disease is disclosed. One embodiment comprises the steps of (a) exposing a component of a patient's visual system to light treatment, wherein the light treatment is characterized by wavelength of between 630-1000 nm and power intensity between 10-90 mW/cm² for a time of 1-3 minutes, and (b) observing restoration of visual system function.

Publication number	US7354432 B2
Publication type	Grant
Application number	US 10/758,793
Publication date	Apr 8, 2008
Filing date	Jan 16, 2004
Priority date	Jan 17, 2003
Fee status	Paid
Also published as	US7744590, US20040215293, US20090062888
Inventors	Janis T. Eells, Margaret T. T. Wong-Riley, Harry T. Whelan
Original Assignee	Mcw Research Foundation, Inc.
Export Citation	BiBTeX, EndNote, RefMan

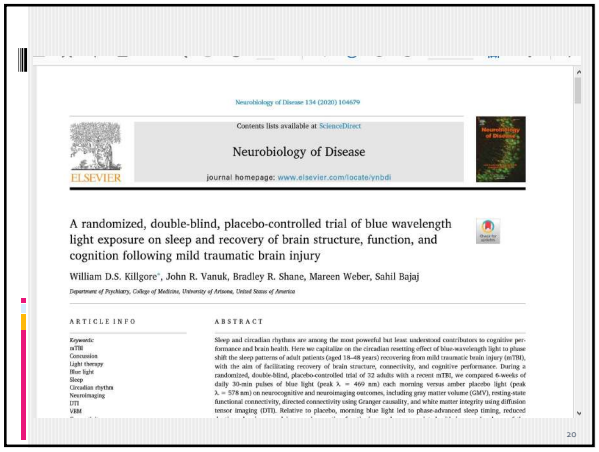
Patent Citations (14), Non-Patent Citations (48), Referenced by (34), Classifications (8), Legal Events (4)

External Links: USPTO, USPTO Assignment, Espacenet

IMAGES (10)

Try the new Google Patents, with machine-classified Google Scholar results, and Japanese and South Korean patents.

19



Neurobiology of Disease 134 (2020) 104679

Contents lists available at ScienceDirect

Neurobiology of Disease

journal homepage: www.elsevier.com/locate/ynbdi

A randomized, double-blind, placebo-controlled trial of blue wavelength light exposure on sleep and recovery of brain structure, function, and cognition following mild traumatic brain injury

William D.S. Killgore*, John R. Vanuk, Bradley R. Shane, Mareen Weber, Sahil Bajaj

Department of Psychiatry, College of Medicine, University of Arizona, United States of America

ARTICLE INFO

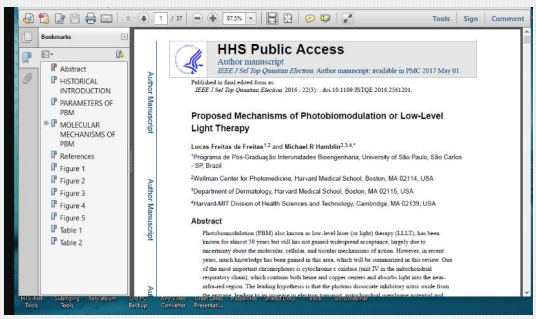
Keywords:
mTBI
Concussion
Light therapy
Blue light
Sleep
Circadian rhythm
Neuroimaging
DTI
VBM

ABSTRACT

Sleep and circadian rhythms are among the most powerful but least understood contributors to cognitive performance and brain health. Here we capitalize on the circadian resetting effect of blue-wavelength light to phase shift the sleep patterns of adult patients (aged 18–48 years) recovering from mild traumatic brain injury (mTBI), with the aim of facilitating recovery of brain structure, connectivity, and cognitive performance. During a randomized, double-blind, placebo-controlled trial of 32 adults with a recent mTBI, we compared 6-weeks of daily 30-min pulses of blue light (peak λ = 460 nm) each morning versus amber placebo light (peak λ = 578 nm) on neurocognitive and neuroimaging outcomes, including gray matter volume (GMV), resting-state functional connectivity, directed connectivity using Granger causality, and white matter integrity using diffusion tensor imaging (DTI). Relative to placebo, morning blue light led to phase-advanced sleep timing, reduced

20

Photobiomodulation



HHS Public Access

Author manuscript

IEEE J Sel Top Quantum Electron. Author manuscript; available in PMC 2017 May 01.

Published in final edited form as:

IEEE J Sel Top Quantum Electron. 2016 ; 22(3): . doi:10.1109/JSTQE.2016.2561201.

Proposed Mechanisms of Photobiomodulation or Low-Level Light Therapy

Lucas Freitas de Freitas[1,2] and Michael R Hamblin[2-5,*]

[1]Programa de Pós-Graduação Interunidades Bioengenharia, University of São Paulo, São Carlos - SP, Brazil

[2]Wellman Center for Photomedicine, Harvard Medical School, Boston, MA 02114, USA

[3]Department of Dermatology, Harvard Medical School, Boston, MA 02115, USA

[4]Harvard-MIT Division of Health Sciences and Technology, Cambridge, MA 02139, USA

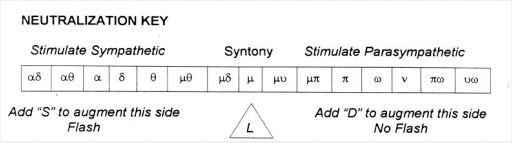
Abstract

Photobiomodulation (PBM) also known as low-level laser (or light) therapy (LLLT), has been known for almost 50 years but still has not gained widespread acceptance, largely due to uncertainty about the molecular, cellular, and tissular mechanisms of action. However, in recent years, much knowledge has been gained in this area, which will be summarized in this review. One of the most important chromophores is cytochrome c oxidase (unit IV in the mitochondrial respiratory chain), which contains both heme and copper centers and absorbs light into the near-infra-red region. The leading hypothesis is that the photons dissociate inhibitory nitric oxide from the Cu center, leading to an increase in electron transport, mitochondrial membrane potential and

Robert Fox, OD, FCOVD, FCSO Syntonics 101

21

Balance Board – general considerations



Red end of spectrum= sympathetic stimulation

Blue end of spectrum= parasympathetic stimulation

22

Red = sensory stimulant
Orange = motor stimulant
Yellow = intense motor stimulant

Green equalizes for physiological balance

Blue = sensory depressant
Indigo = motor depressant
Violet = intense sensory depressant

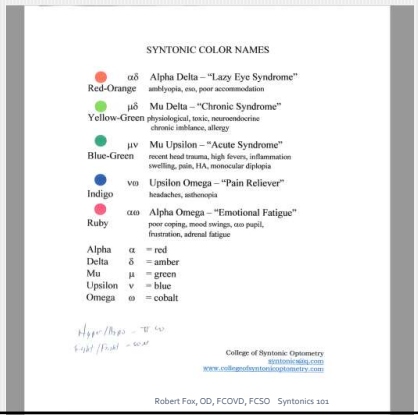
23

α alpha = red
δ delta = amber
μ mu = green
υ upsilon = blue
ω omega = indigo

24

The "Miracle Workers"

- Chronic Syndrome
- Acute Syndrome
- Amblyopia/Esotropia Syndrome
- Emotional / Adrenal Exhaustion Syndrome



SYNTONIC COLOR NAMES

Red-Orange	αδ	Alpha Delta – "Lazy Eye Syndrome" amblyopia, eso, poor accommodation
Yellow-Green	μδ	Mu Delta – "Chronic Syndrome" physiological, toxic, neuroendocrine chronic imbalance, allergy
Blue-Green	μν	Mu Upsilon – "Acute Syndrome" recent head trauma, high fevers, inflammation swelling, pain, HA, monocular diplopia
Indigo	νω	Upsilon Omega – "Pain Reliever" headaches, asthenopia
Ruby	αω	Alpha Omega – "Emotional Fatigue" poor coping, mood swings, αω pupil, frustration, adrenal fatigue

Alpha	α	= red
Delta	δ	= amber
Mu	μ	= green
Upsilon	ν	= blue
Omega	ω	= cobalt

College of Syntonic Optometry
syntonicsiqq.com
www.collegeofsyntonicoptometry.com

Lemon

Mu Delta – "Chronic Syndrome"
physiologic stabilizer

Dx: convergence excess, esophoria/esotropia
alpha omega pupil and poor oculomotor
constricted visual field for form or color
low recovery on ductions (especially BI)

Sx: toxic or neuroendocrine imbalance
chronic health problems or past trauma

Tx: stimulate sympathetic, create exo response

Ruby Alpha Omega – "Emotional Fatigue" Syndrome

Dx: alpha omega pupil, fatigue exo, low breaks and recoveries (especially BO), adrenal fatigue

Sx: photophobia, transient blurred vision, fatigue, headache

Tx: balance parasympathetic and sympathetic

28

Treatment Protocol (end at middle of spectrum)

Ruby Alpha Omega

\+

Lemon Mu Delta

29

Red-Orange Alpha Delta – "Amblyopia Syndrome"

sensory + motor stimulant

Dx: amblyopia, esotropia, poor accommodation, constricted visual field, reduced vergence ranges

Sx: reduced acuity on one eye, head tilt or turn, poor depth judgment, diplopia
also slow reading speed and poor handwriting

Tx: stimulate sympathetic
especially in long standing strabismus

30

Alpha Delta – "Amblyopia Syndrome"

Red-Orange amblyopia, eso, poor accommodation

Mu Delta – "Chronic Syndrome"

Lemon physiological, toxic, neuroendocrine

31

Why Red-Orange or Lemon ?

- Sympathetic Activation
- Sensory and Motor Stimulant
- For amblyopia, esotropia
- Stimulates Exo Response

32

Treatment Protocol (end at middle of spectrum)

Red-Orange Alpha Delta

+

Lemon Mu Delta

33

Alpha Omega – "Emotional Fatigue"

Ruby pupil, adrenal fatigue, emotional trauma, exhaustion, mood swings

34

Color Combinations

- Alpha Delta + Mu Delta (esotropia)
- Alpha Omega + Mu Delta (80% of cases)
- Alpha Omega (alone)

Always end at the middle of the balance board

35

Mu Upsilon – "Acute Syndrome"

Blue-Green recent head trauma, anoxia, stroke

Dx: exophoria, exotropia, convergence insufficiency (PTVS), alpha omega pupil, enlarged blind spot, poor ocm / accommodation

Sx: headache, motion sickness, vertigo, transient blurred vision, diplopia (monocular)

Tx: stimulate parasympathetic

36

Why Indigo or Blue-Green ?

- Parasympathetic Activation
- Sensory and Motor Depressant
- For Pain and Spasm
- Stimulates Eso Response

37

Indigo

Upsilon Omega – "Pain Reliever"

not a syndrome

headaches, asthenopia

38

Blue-Green

Mu Upsilon – "Acute Syndrome"

recent head trauma, high fevers, inflammation, swelling, pain, HA, monocular diplopia

Indigo

(Violet)

Upsilon Omega – "Pain Reliever"

headaches, asthenopia

39

Treatment Protocol (end at middle of spectrum)

Indigo

Blue-Green

Upsilon Omega

+

Mu Upsilon

40

Color Combinations

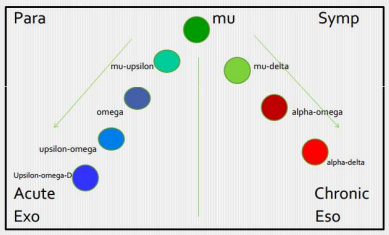
- Mu-Upsilon
- Upsilon-Omega + Mu-Upsilon
- Omega + Mu-Upsilon

Treatment Protocol

- Frequency of light into the eye
- 20 minutes per session
- Minimum of 4x per week
- Progress Evaluation every 8 sessions
  repeat history, vision analysis, VF
- Low Risk and Few Side Effects

42

Hancock Decision Tree



Questions?

- See you tomorrow!!